BACK ON PATROL
MARITIME MISSION MAKES WAVES AT DSEI GATHERING
SHOW REPORT P18

LETHAL EAGLE
Boeing touts beefed-up F-15C for US Air Force, in hope of keeping fighter on frontline until 2040 **16**

E2 ADVANCES
How Embraer is taking its E-Jet evolution from the drawing board to regional readiness **26**

FLIGHT INTERNATIONAL

From Flightglobal

22-28 SEPTEMBER 2015

PRODUCTION

AT HOME IN ALABAMA

Airbus opens Mobile A320 final assembly line as European advance continues on US soil

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VOLUME 188 NUMBER 5506

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Airbus

COVER IMAGE

Airbus supplied this image of its new final assembly line in Mobile, Alabama for the A320 family, as the facility opened its doors on 14 September P14

BEHIND THE HEADLINES

Stephen Trimble travelled to Mobile, Alabama for the opening of the **Airbus A320** family final assembly line and delivery centre (**P14**). And **Beth Stevenson** visited the German air force's Tornado training wing at **Holloman AFB,** New Mexico (**P17**)

Craig Hoyle/Flightglobal

NEXT WEEK HELICOPTERS

Ahead of the Helitech show, we look at the civil rotorcraft sector, and meet the team at London's Air Ambulance

NEWS

THIS WEEK

AIR TRANSPORT

DEFENCE

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BAE Systems

Night vision testing for Striker II helmet display P20

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REGULARS

Embraer, Piaggio Aerospace

Automation assists assembly of Embraer's E190-E2 P26. UK's Zenith expects Piaggio Evo by December P24

IMAGE OF THE WEEK

Japanese airline All Nippon Airways has revealed one of its Boeing 787-9 Dreamliners sporting a Star Wars-themed livery. The paint job represents the film's character R2-D2, and is the first of three aircraft that will receive new liveries to mark the release of *Star Wars: The Force Awakens* in December

View more great aviation shots online and in our weekly tablet edition:

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Boeing

THE WEEK IN NUMBERS

33%

Flightglobal dashboard

In 2014, Bahrain's Gulf Air cut losses to $166 million and now says it is moving to "full commercial sustainability"

$200m

Blue Origin

Rocket maker Blue Origin's investment in a new launch and manufacturing base at Cape Canaveral will create 330 jobs

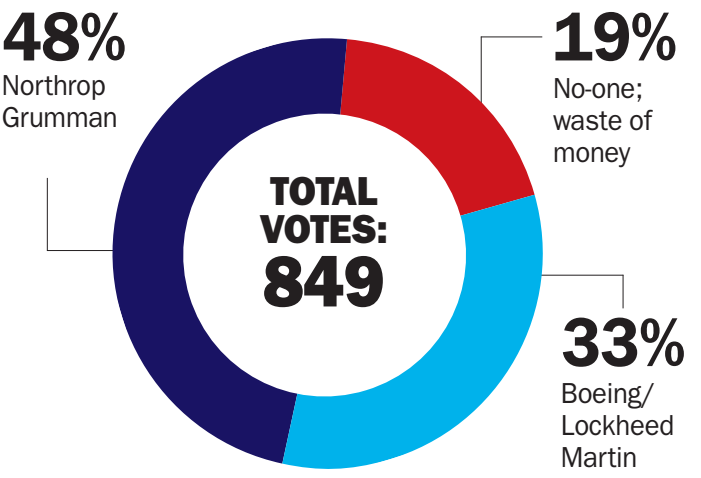
450

B/E Aerospace

Jobs to go at cabin interior products maker B/E Aerospace with slowing revenue growth projected for 2015-2016

QUESTION OF THE WEEK

Last week, we asked:
Who should build the US Air Force's new bomber?: You said:



This week, we ask: **With its Mobile final assembly line, Airbus can**
❑ Easily reach A320 production goals
❑ Steal more US orders from Boeing ❑ Grab a few early headlines
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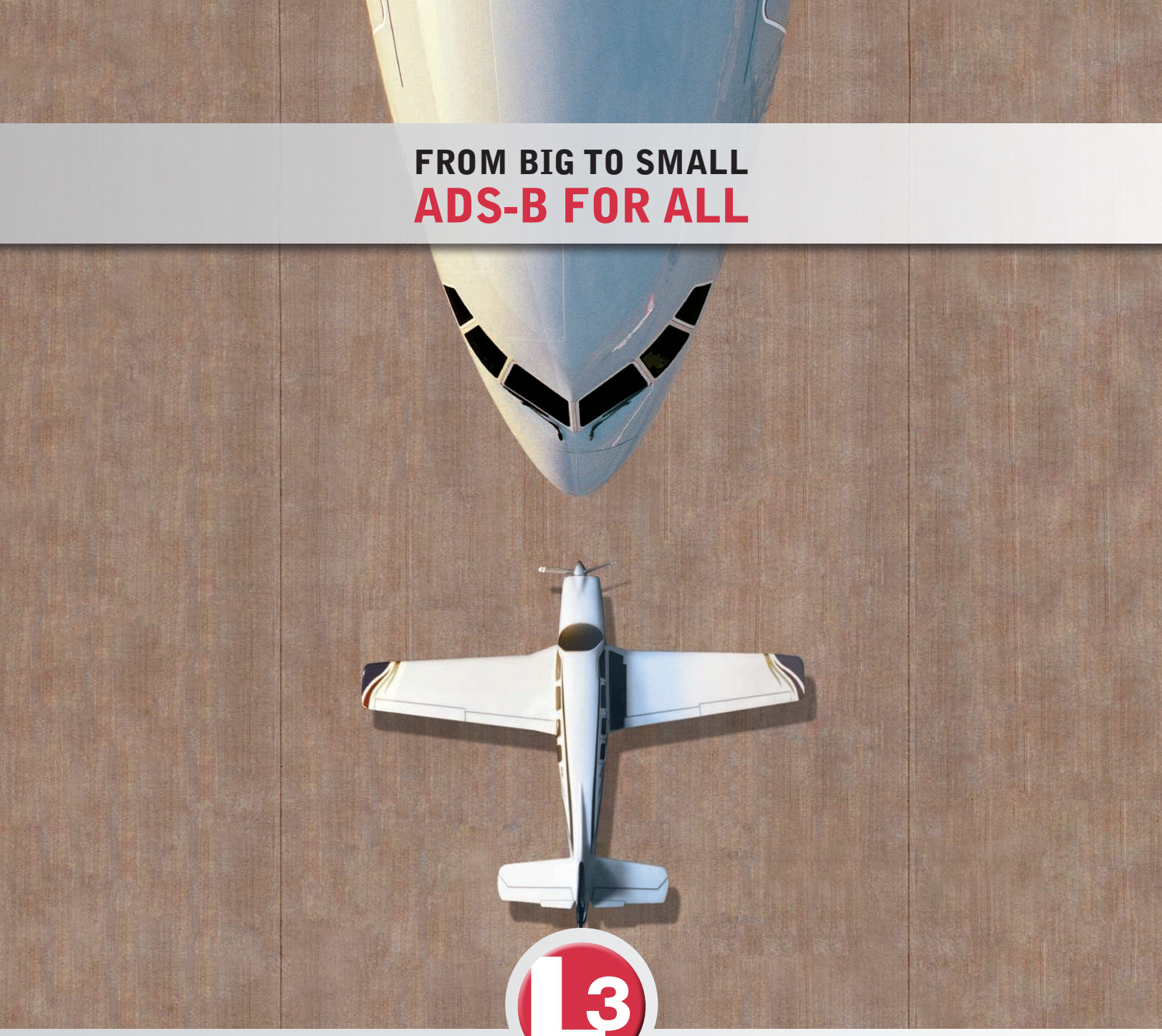
FROM BIG TO SMALL
ADS-B FOR ALL



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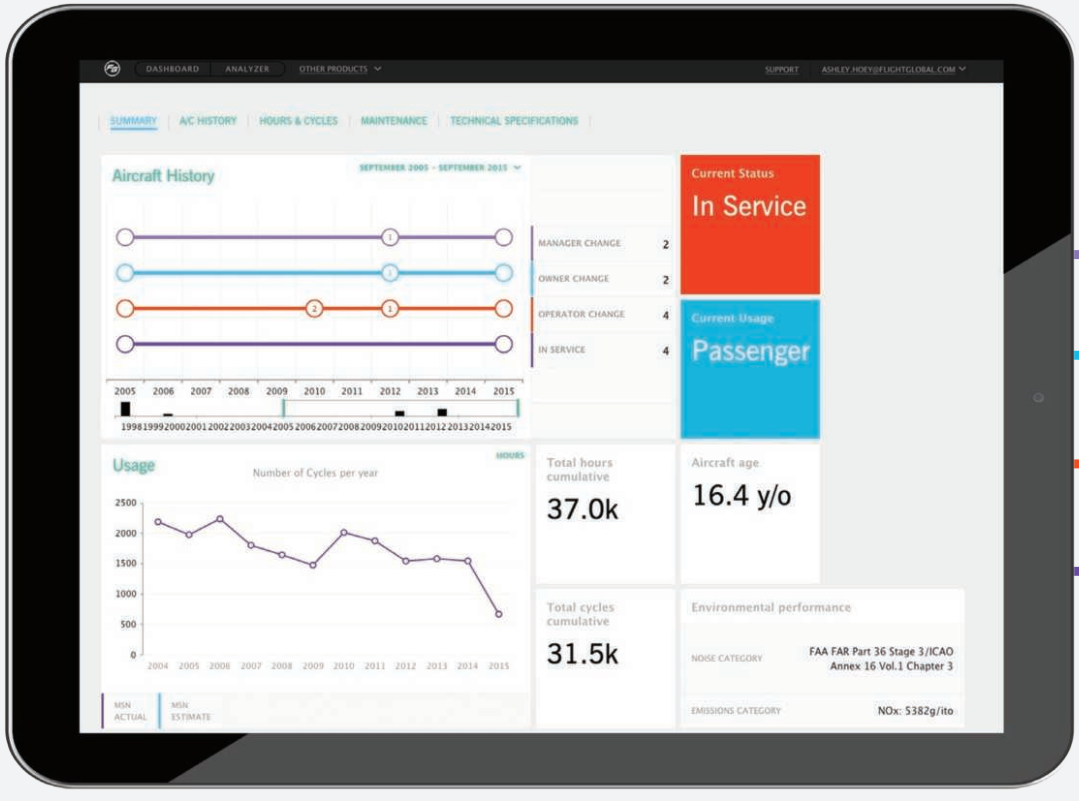


Illustration shows conceptual data only

Made in America

A number of factors prompted Airbus to open a new final assembly line for the A320 in Mobile, Alabama, but the possibility of chipping away at its rival's home advantage may top the list

Politics, economics and optics are usually cited by Airbus officials to justify opening a $600 million factory in Mobile, Alabama, and no doubt each played at least a minor role in the decision.

But the fundamental reason that four A320 family aircraft will be rolling off a US assembly line each month may be more simple: because Airbus can.

An A320 includes a forward fuselage built in France, an aft fuselage and vertical tails made in Germany, wings from the UK, and horizontal tails produced in Spain. All of those pieces are already assembled on separate lines in China, France and Germany.

Functionally it is no stretch to plant a new A320 family assembly hall on the banks of a south Alabama estuary. Neither is there great risk of creating too much manufacturing capacity. Global A320 family production rates are already set to rise to 50 per month in the first quarter of 2017. Airbus executives also may announce yet another escalation by the end of this year.

In a globalised age, Airbus can wield its exportable assembly process as a secret weapon

In "hard" economic terms, however, the move may seem more trouble than it's worth. Although Airbus points to the favourable economics of producing aircraft in US dollars and lower labour costs, it remains unclear if these offset the higher shipping costs and reduced economies of scale. It is unlikely the Airbus plant by itself will generate a wave of new orders from North American airlines, many of whom are already operators of the European-built jets.

If "because Airbus can" leads to an unsatisfying answer, however, perhaps a better justification for the Mobile factory is rather this: "because Boeing can't".

Airbus

Take that, Boeing

Of course, opening a site in Alabama is certainly within Boeing's corporate capacity. Its defence and space division already operates a significant production and engineering site in Huntsville. And 787s are also being built in North Charleston, South Carolina.

But would Boeing ever export commercial aircraft final assembly overseas? Boeing has strong industrial partnerships with Japan, and to a lesser degree Italy, at the major assembly level. But the company has never produced its jets anywhere outside of US soil, nor apparently even seriously considered such a move.

In a globalised age, Airbus can wield its exportable final assembly process as a secret weapon of soft power. In a single move, Airbus threatens Boeing's sense that it owns title to the "Made in America" sticker – which, for American customers, is not nothing – and moves closer to a current and future growth market for its most successful product. ■

See News Focus P14

To infinity, and… hold on!

Spaceflight has always had a dual personality. For a case study, look no further than Virgin Galactic.

As we learn this week, the firm is making steady progress towards providing an air-launch service for small satellites. Meanwhile, its original business – to air-launch a rocket-plane capable of taking six passengers on a short suborbital ride, for $250,000 a seat – languishes years behind schedule and is awaiting the outcome of the investigation into last year's fatal test crash.

Both projects demand lots of engineering but build on established practice. The difference, however, is fundamental – and is a distinction that everyone else in the space business should note. The push to offer a satellite launch service stems from confidence that a clear market demand could be satisfied profitably with acceptable risk by applying commercial sector cost control to a limited objective. The reasonable expectation that satisfying this demand economically will lead to more demand makes for growth; a sound investment.

Suborbital tourism, on the other hand, is a wildly risky venture motivated by ideas like saving the world by letting people see its beauty from space and unshackling humankind from the confines of one mere dot of a planet in the vast cosmos and… whatever.

Spaceflight, in short, is a solid engineering business too often burdened by visions of a dubiously desirable future just beyond human reach. ■

See This Week P8

For up-to-the-minute aviation and aerospace news and analysis, go to: flightglobal.com/news

BRIEFING

WIZZ AIR CONFIRMS PARIS A321NEO ORDER

COMMITMENT Central European low-cost carrier Wizz Air has firmed a tentative commitment for 110 Airbus A321neos, initially agreed during this year's Paris air show. Wizz will now seek final shareholder approval for the deal, and make an engine selection before the end of 2016. Deliveries are due to occur between 2019 and 2024. Wizz has also taken purchase rights for another 90 A321neos.

CITY AIRWAYS SEALS DEAL FOR ARJ21, C919

ORDER Thailand's City Airways on 16 September signed a tripartite agreement with Comac and ICBC Leasing to take 10 C919 narrow-bodies and 10 ARJ21 regional jets. ICBC says it will help City Airways with the necessary leasing and financing options for its purchase. Three of each aircraft type for the carrier will come from the lessor's earlier commitment for 45 C919s and 30 ARJ21s, Comac says.

JASSM ACQUISITION CLEARED FOR POLAND

WEAPONS Lockheed Martin has received a Foreign Military Sales contract to integrate its AGM-158 JASSM cruise missile with the Polish air force's F-16 fleet. A deal outlined last year indicates that the programme's value is around $500 million, including an initial 40 of the long-range weapons. JASSM has also been sold to export operators Australia and Finland, for use from the Boeing F-18.

MITSUBISHI EXPANDS TO MEET 787 RATE RISE

SUPPLY CHAIN Mitsubishi Heavy Industries (MHI) has completed the expansion of its wingbox stringer production facility in Yamaguchi prefecture to meet Boeing's planned 787 rate increase. The Shimonoseki Shipyard & Machinery Works supplies the reinforcing components to MHI's Oye wingbox plant, where output is also to increase. Boeing plans to take 787 production to 14 per month by the end of the decade. The airframer has additionally selected China's Chengfei Commercial Aircraft to produce rudders for the 787-10.

EUROPE CHOSEN FOR NEW GE TURBOPROP PLANT

INVESTMENT GE Aviation is to spend $400 million to set up a new turboprop engine development and production facility in Europe that will eventually support 500-1,000 jobs. The propulsion specialist says it has chosen to locate the new operation in Europe chiefly due to the demise of the US Export Import Bank, whose authorisation expired on 1 July. Since then, it has begun talks with several alternative export credit agencies to provide finance. It will also make further investments at its operations in Canada and Brazil.

CHINESE CARRIERS PICK P&W, IAE FOR A320S

PROPULSION Sichuan Airlines has selected Pratt & Whitney PW1100G-JM geared turbofans to power the 24 Airbus A320neos it has on order. Sichuan is the first Chinese carrier to pick the geared turbofan engines for its Neo fleet. Separately, Juneyao Airlines has chosen International Aero Engines V2500s for its 12 ordered A321s. Flightglobal's Fleets Analyzer database reveals that Juneyao's current 45 A320-family aircraft are powered by CFM International CFM56 engines.

CH-53K ADVANCES ON FIRST FLIGHT

DEBUT Sikorsky's CH-53K should make its first flight by November, says Sean Stackley, the US Navy's assistant secretary for research, development and acquisition. The delayed type is due to achieve initial operational capability with the US Marine Corps in 2019.

KPA/Zuma/Rex Shutterstock

WhiteKnightTwo will launch satellites and suborbital tourist flights

SPACEFLIGHT **DAN THISDELL** LONDON

Second carrier to increase payloads for Virgin Galactic

Small satellite air-launch service to almost double capacity and increase flight rates by acquiring an additional aircraft

Virgin Galactic is buying a second carrier aircraft for its nascent small satellite air-launch service, to nearly double the payload capacity possible from the custom-built, twin-fuselage WhiteKnightTwo (WK2), that will also serve its suborbital tourist flights.

Combined with an enlarged fuel tank for its in-development LauncherOne rocket, the new aircraft – described by Virgin Galactic as "commercial" – promises to launch up to 200kg (441lb) to 600-800km sun-synchronous orbits for Earth observation or scientific missions, or up to 400kg to low-Earth orbits – up from 120kg and 250kg, respectively.

A second aircraft will also allow a "significantly higher" flight rate. The company expects to test-fly LauncherOne before mid-2017.

Launch cost is being held at $10 million, but customers could pay extra for even larger payloads and/or higher orbits. Chief executive George Whitesides says it is normal practice to "hold back some performance" – and the company has more to offer.

He declines to reveal what sort of aircraft Virgin Galactic is about to buy, but says the Scaled Composites-built WK2 is a payload-limiting factor.

WK2 is designed to carry the six-passenger SpaceShipTwo or LauncherOne to about 50,000ft, suspended between its twin fuselages. However, the new aircraft need not be so exotic. Orbital ATK's three-stage Pegasus rocket – big enough to orbit some 600kg – is carried aloft underneath the body of a modified Lockheed L-1011 TriStar.

Enlarging the rocket's fuel tank is an obvious performance booster, but Virgin Galactic has other cards to play. The company describes its two-stage oxygen-kerosene Newton engine as tried-and-tested technology for a conservative approach to early operations. But it employs some 150 engineers, representing expertise from every US rocket type, and indicates that more exotic propulsion systems could follow.

Virgin Galactic is not short of talent. From its new design and manufacturing plant in aerospace-steeped Long Beach, California, it is just possible to see Boeing's C-17 assembly plant, which will close for good on the delivery of its last airlifter. ■

AW609 testing accelerates
THIS WEEK P10

ORDER CRAIG HOYLE LONDON

Gulf state becomes newest member of Eurofighter club

Consortium says fresh commitment from Kuwait is typical of growing interest in the region

Kuwait has reached an agreement with the Italian government linked to the planned acquisition of 28 Eurofighter Typhoons.

"We are delighted to welcome Kuwait as the newest member of our Eurofighter Typhoon family," says consortium chief executive Alberto Gutierrez, who describes the selection as "a great opportunity for further Eurofighter orders." After waiting for almost three years since its last international sale, the programme is now seeing "growing interest across the globe, and in the Gulf region in particular," Gutierrez adds.

Current operators are European partner nations Germany, Italy, Spain and the UK, plus export users Austria and Saudi Arabia. Twelve of the type are also to be delivered to Oman, under a contract signed with the UK in December 2012.

Eurofighter says total commitments to the Eurojet EJ200-powered combat aircraft stand at 599 units, including the Kuwaiti acquisition, a contract for which has yet to be finalised.

Italy and Eurofighter partner company Alenia Aermacchi have led the consortium's export campaign in Kuwait, where the type has faced competition including the Boeing F/A-18E/F Super Hornet and Dassault Rafale.

Eurofighter

Kuwait will take delivery of 28 Typhoons under Italian agreement

Earlier this year, Boeing officials spoke optimistically about the prospects of a Super Hornet deal with the Gulf nation, which already operates the F/A-18C/D.

Meanwhile, the UK Ministry of Defence is to take the lead on some of the nation's key export campaigns, including those linked to the Typhoon and complex weapons products.

"These are areas where my department is best placed to offer unique benefits, such as the exchanges, advice, doctrine and training that can enhance the long-term capabilities of our partners, and increase the interoperability that they are seeking," defence secretary Michael Fallon said at the Defence and Security Equipment International exhibition in London on 16 September.

Fallon used the event to announce a contract with MBDA worth more than £300 million ($463 million), to supply extra ASRAAM short-range air-to-air missiles for the Royal Air Force's Typhoons. The capability sustainment deal will deliver new weapons using technologies developed for the company's common anti-air modular missile family. ■

See Show Report P18

DEFENCE CRAIG HOYLE LONDON

Airbus delivers seventh A400M to Brize Norton

The UK Royal Air Force has achieved the in-service date for its Airbus A400M tactical transport, with the transfer of a seventh aircraft from Airbus Defence & Space.

Previously scheduled to occur in March, the in-service target had been missed earlier this year, with a further delay caused by the fatal crash of an Airbus-crewed A400M in Seville, Spain during May.

Airbus has delivered four A400Ms to RAF Brize Norton in Oxfordshire, with another three transferred to support testing of its defensive aids system for the UK.

The service will field 22 A400Ms under an acquisition worth £2.75 billion

The service will eventually field 22 of the type, under an acquisition worth £2.75 billion ($4.2 billion). Announcing the development on 15 September, minister of state for defence procurement Philip Dunne said the latest handover means the RAF's Atlas "can now undertake tasks wherever it is needed around the world". ■

MANUFACTURING STEPHEN TRIMBLE WASHINGTON DC

New assembly line starts work on initial 737 Max

Boeing has installed the first 737 Max fuselage on a new final assembly line in Renton, Washington, starting a new phase in a countdown to flight-test operations beginning next year.

The milestone means the re-engining programme is on track to deliver the first 737 Max 8 in the third quarter of 2017, according to Boeing. "We have a lot more work ahead but we're pleased with our progress," says Keith Leverkuhn, vice-president and general manager for the 737 Max programme.

Boeing

Flight tests of the re-engined narrowbody are due to begin in 2016

Boeing launched the 737 Max nearly four years ago with a new engine – the CFM International Leap-1B – and other new features, including a new split-tip winglet design, cockpit displays and a re-lofted tail cone. The design changes are being adopted in the production system even as Boeing's factory and supply chain copes with record demand.

Output of 737NG-family aircraft from Renton has doubled in the past decade, from 21 per month in 2005 to 42. The rate will continue to grow to 47 in 2017 and 52 in 2018, as Boeing transitions the production system to the Max. To cope, Boeing has established a third production line for the 737 in the Renton factory's 482 building, initially dedicated to flight-test Max aircraft. ■

For more in-depth coverage of the global rotorcraft sector, go online to flightglobal.com/helicopters

DIVESTMENT
MURDO MORRISON DUBAI

Ferrari sells off remaining stake in Piaggio Aero

Seventeen years after heading a consortium that rescued Piaggio Aerospace from bankruptcy, Piero Ferrari has ended his financial links with the Italian aircraft maker.

Ferrari has sold his remaining 1.95% stake to Mubadala, making the Abu Dhabi investment house the 100% owner of the company behind the P180 Avanti II twin-pusher and its unmanned P1.HH HammerHead military reconnaissance derivative.

The head of the family behind the famous racing car brand has been reducing his shareholding since Mubadala and Indian combine Tata bought into the business in the 2000s.

In 2013, the two increased their combined stake to 85.5% after injecting $253 million in cash, with Tata later selling its share to Mubadala.

Under Mubadala, Piaggio has been trying to reposition itself in the defence and special missions market with variants of the P180, which has struggled for sales since the late 2000s. ■

See Business Aviation P24

DEVELOPMENT **DOMINIC PERRY** LONDON

AW609 testing accelerates

AgustaWestland intensifies its tiltrotor certification effort with two additional prototypes

AgustaWestland will fly the third prototype of its AW609 tiltrotor late this year as the manufacturer accelerates testing activity ahead of planned certification in 2017.

Two flight-test articles dating from the early days of the programme – then a joint development with Bell – have been used for the validation campaign so far and have amassed 1,300h, alongside 300h of ground runs.

But the initial aircraft is "reaching the end of its useful life", says Paul Edwards, experimental test pilot at AgustaWestland, and two subsequent prototypes are needed to attain US Federal Aviation Administration approval.

Prototype three is "in final build" at the manufacturer's plant in Vergiate, Italy, he told a conference on future rotorcraft in London on 14 September. It will be transported to its Philadelphia, Pennsylvania facility – the location of the tiltrotor's eventual final assembly line – late this year, to be used for icing trials and then cold weather testing.

The fourth flight-test article, which will have the production standard cockpit installed, is also being built in Philadelphia.

AgustaWestland

The manufacturer has worked with the FAA on certification rules

Service entry is scheduled for 2018 and Edwards anticipates rapid take-up of the Pratt & Whitney Canada PT6-powered type.

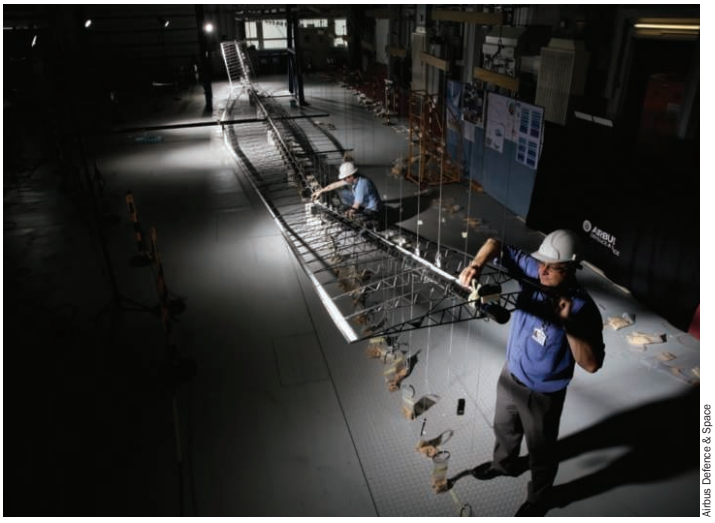
With no certification standard existing for the tiltrotor, AgustaWestland has worked with the FAA to develop hybrid rules – what it calls the Powered Lift Certification Requirement – that draw on regulations from both the fixed- and rotary-wing worlds. These include proving that the aircraft can perform both gliding and autorotation landings in the event of engine failure, as well as rapid reconversion from forward flight, and flare before touchdown.

So far, 28 power-off reconversions have been performed, although the aircraft has yet to pass certification trials for the engine-out state. Edwards says the evaluations have also dispelled the view that tiltrotors are vulnerable to vortex ring settling, saying the pilots had "to try really hard to get there".

"It was about to fly itself out when we applied the recovery technique. Both rotors are not going to enter vortex ring simultaneously – it slides sideways to get itself out." ■

UNMANNED SYSTEMS **CRAIG HOYLE** LONDON

Next generation of Zephyr platform set to breeze in



Airbus Defence & Space

Solar panels and lithium-sulphur batteries enable long endurance

Airbus Defence & Space has begun developing a next-generation version of its long-endurance Zephyr platform, with the design to feature an increased 35m (115ft) wingspan and, at 40kg (88lb), a heftier payload capacity.

No additional details have been released about the "Gen 2" system, but the company will build on its past experience with developing and flying a range of air vehicles for a combined 900h over the past several years.

Dubbed a high-altitude pseudo satellite, the Zephyr is designed to perform persistent surveillance or communications relay tasks from an altitude of 70,000ft.

Its longest flight to date lasted for two weeks, but Airbus says it is capable of remaining airborne for three months, using solar panels and lithium-sulphur batteries.

Next year will see the first flight of a Zephyr 8 version of the aircraft, which has a slightly larger fuselage but retains the current iteration's 25m wingspan, and weighs around 40% less than its predecessor's 55kg.

A first example has been built in Farnborough, in the UK, and has already undergone pre-load tests ahead of its 2016 flight debut, says head of business development Steve Whitby. Another three are in production. ■

Hydraulics failure led to fatal overrun
AIR TRANSPORT P12

REGULATION **STEPHEN TRIMBLE** MOBILE

Battery of tests to usher in return of A350 Li-ion power

Introduction of lightweight system initially delayed due to fires on board Boeing 787s now at final approval stage

Airbus has reached the final stages of regulatory reviews over a plan to use lithium-ion batteries for backup and starting power on the A350-900, says executive vice-president of engineering Charles Champion.

But well-publicised safety problems with lithium-ion batteries on the Boeing 787-8 and other aircraft have extended the regulatory review process.

"We might have to do a few more tests because authorities are extremely nervous on the subject because of the Boeing 787," Champion says.

"We are confident with our system because we have a different architecture than Boeing"

CHARLES CHAMPION
Executive vice-president of engineering

The A350 entered service with nickel-cadmium cells instead of the planned lithium-ion units, but the aiframer hopes to reverse this move.

Airbus has already decided to make one design change to the original lithium-ion battery system for the A350-900, which allowed power to flow between the batteries. However, that raised concerns that one overheating battery could cause another to fail. "So we put in a non-return valve so that if it blows out, it doesn't go back in the other battery," Champion says.

It is also still trying to persuade regulators that it is safe to install such powerful lithium-ion batteries inside an aircraft without enclosing them inside a heavy stainless steel box, something which Champion likens to a "huge coffin".

That limitation was the direct result of two battery fires on 787s in January 2013, which subsequently led to a four-month grounding of the Dreamliner fleet.

Airbus

Finnair's initial A350-900 flew for the first time on 16 September

The restriction was only lifted after Boeing convinced the US Federal Aviation Administration that a new steel enclosure would prevent a fire from causing damage to the aircraft. Weight saving is one of the key advantages of lithium-ion batteries, so Airbus hopes to maintain their benefit by fitting the batteries in an enclosure made of materials lighter than stainless steel.

The FAA allowed Boeing to introduce the 787-8 with an aluminium battery enclosure because certification testing – which was later determined to be inadequate – appeared to prove that its lithium-ion design met safety standards.

Airbus, however, remains confident that its revised battery design for the A350-900 has always been safer than Boeing's original system for the 787-8.

Boeing's design includes two GS Yuasa-made batteries with eight 3.7V-cells each, storing 72Ah of electrical power per battery.

Airbus took a more conservative approach, selecting four Saft-made batteries with 14 3.6V-cells each, storing a total 45Ah. Saft also supplies the battery and charging unit, whereas Boeing's divided the system between two suppliers.

"We are confident with our system because we have a different architecture than Boeing," Champion says. ■

ACCIDENT **DAVID KAMINSKI-MORROW** LONDON

Hydraulics failure led to fatal overrun

Fast touchdown of Sriwijaya 737 compounded by loss of system pressure that left pilots unable to deploy reverse thrusters

Indonesian investigators believe a fast touchdown after a hydraulic system failure preceded a fatal overrun by a Sriwijaya Air Boeing 737-200 at Jambi.

The crew noticed the hydraulic failure – in the aircraft's 'A' circuit – after selecting 15° flaps on approach to Jambi's runway 31.

While the National Transportation Safety Committee says the pilots had "sufficient time" to execute a missed approach and review the implications of the failure, they instead opted to continue the landing.

Loss of the hydraulic pressure affected several systems on the jet including flaps, spoilers, reverse thrust, and nose-wheel steering.

The pilots had expected to use 40° flap but recalculated the approach for the 15° configuration.

The pilots applied brakes but the 737 overran into fields, hitting three farmers, fatally injuring one

Airteamimages

Investigators concluded that the twinjet's stopping distance would have exceeded the runway length

Investigators state that the approach speed should have been 138kt (255km/h).

In order to maximise available runway length the captain chose to fly below the normal glidepath in a bid to touch down early. Jambi's runway is 2,220m (7,280ft) long and the crew had been advised of rain over the airport.

The aircraft touched down at 165kt, far above the proper reference speed. Its crew was unable to deploy reverse-thrust and the inquiry says an "absence" of speed-brake selection left the spoilers stowed.

Although the pilots applied brakes the 737 did not decelerate sufficiently and the jet overran into fields, hitting three farmers, fatally injuring one of them.

Investigators' analysis of the 27 August 2008 accident indicates that the aircraft, flown correctly for the conditions, should have been able to land in a distance of 5,280ft.

However, the stopping distance calculated on the basis of information retrieved from the 737's flight-data recorder would have exceeded 8,600ft.

Both engines and parts of the landing-gear detached from the aircraft (PK-CJG) before it came to a halt. Twelve of its 130 occupants, as well as the other two farmers, were seriously injured. ■

INVESTIGATION **DAVID KAMINSKI-MORROW** LONDON

Xian MA60 pilots dithered as engine fire took hold

Indonesian investigators have revealed that the pilots of a Merpati Nusantara Xian MA60 (PK-MZG) discussed an engine fire warning, and even called an engineer to the cockpit, before they took action to tackle the blaze.

The National Transportation Safety Committee says the crew delayed their response for 1min 16s, adding that this "prolonged" exposure to risk posed by the fire threatened to "jeopardise" the safety of the flight.

Airteamimages

A fuel leak had been present for the aircraft's nine previous flights

It says the aircraft had been climbing through 6,000ft – en route from Bima to Denpasar on 12 December 2011 – when the fire warning activated for the left-hand Pratt & Whitney Canada PW127J engine. Instead of shutting down the engine immediately the pilots discussed the event for 44s before asking the cabin crew to call the engineer to the cockpit.

Only after the engineer told the crew that a fire was visible did the crew begin the fire procedure, feathering the propeller 1min 16s after the warning.

Another 35s passed before the crew activated the fire-extinguisher bottle – but did not shut off the fuel feed beforehand, meaning the action would have been ineffective. Investigators say this indicates the fire drill was "not well pattern-memorised".

The captain opted to return to the departure airport and the pilots continued to deal with the fire while simultaneously preparing to land. They discharged a second fire bottle 4min 33s after the initial alert, but the fire-warning light persisted.

The turboprop eventually landed without further incident.

Investigators traced the fire to a fuel leak originating from a loose fitting in the fuel-flow transmitter, which had been present for the MA60's nine previous flights. ■

Airbus flies the flag as Mobile workers start A320 ramp-up
COVER STORY P14

FLEET AARON CHONG SINGAPORE

AirAsia X looks to alter A330 orders

Long-haul, low-cost airline plans to defer, cancel or sell a number of ordered twinjets as it eyes slower growth path

AirAsia X is in talks with Airbus to defer, cancel or sell more of its ordered A330s which were due to be delivered over the next four years.

The long-haul, low-cost carrier will take receipt of four Rolls-Royce Trent 700-powered A330s in 2015, down from a planned eight. It has received three this year, with another due in October.

Deliveries of two A330s will be deferred, while another two will either be cancelled or sold.

Deliveries of aircraft in 2015, 2016 and 2017 are "pending further confirmation with Airbus"

For 2016, AirAsia X will add two A330s from an earlier deferment to its fleet. However, it plans to cancel or sell the four A330s that are due to arrive that year.

The carrier also plans a similar treatment for all five A330s due in 2017, and will take no new aircraft that year.

In 2018, it will take delivery of two new A330neos, while it cancels or sells another three of the current-generation A330s.

Its plan for the delivery of five A330s in 2019 will proceed as scheduled, however.

AirAsia X adds, however, that deliveries of aircraft in 2015, 2016 and 2017 are "pending further confirmation with Airbus" and "there is no firm delivery plan".

Airbus

Loss-making carrier has a fleet of 16 of the Airbus widebodies

The carrier has reported losses for seven consecutive quarters, with its most recent results showing its net loss growing to MYR133 million ($31.4 million).

It has previously hinted it could defer delivery of its on-order A350s, depending on the performance of the European economy.

Flightglobal's Fleets Analyzer database records AirAsia X as operating a fleet of 16 A330s, with a further 81 aircraft on order, comprising 71 A330s and 10 A350s.

Meanwhile, affiliates Thai AirAsia X and Indonesia AirAsia X operate fleets of three and two A330s, respectively. ■

AUCTION OLIVIER BONNASSIES LONDON

Last remnants of Jade Cargo go under the hammer

Jade Cargo International's remaining Boeing 747-400 freighters are to be auctioned next month, after being grounded for more than three years.

To take place on 26 October, the sale covers three 747-400ERFs – MSNs 35169, 35173 and 35174 – Shenzhen Jiajietai Auction discloses.

One, a 2007-vintage aircraft, is being offered with only three GE Aviation CF6-80C2B5F engines, while the remainder – 2007- and 2008-built examples – both have their full complement of four.

The aircraft, which are at Shanghai Pudong and Shenzhen Bao'an airports, were financed under debt facilities involving Bank of China and HSH Nordbank. Bids are to start at CNY1.32 billion ($207 million).

Jade was founded in 2004 as a German-Chinese joint venture between Lufthansa Cargo (25%), Shenzhen Airlines (51%) and development finance institute DEG (24%). The JV's services began in August 2006.

However, the takeover of Shenzhen Airlines by Air China in early 2010 left the future of Jade uncertain, particularly after Air China provided strong backing for Air China Cargo, a freight venture with Hong Kong's Cathay Pacific Airways.

Jade suspended operations in December 2011 and grounded its six 747-400ERFs.

The other three units are now under lease agreements with Russia's AirBridgeCargo, Luxembourg-based Cargolux, and Israeli operator Cargo Air Lines, Flightglobal's Fleets Analyzer database shows. ■

STRATEGY **STEPHEN TRIMBLE** MOBILE

Airbus flies the flag as Mobile workers start A320 ramp-up

Fourth assembly line for in-demand narrowbody will help airframer to raise global output and address US carriers

With the grand opening of the Airbus factory in Mobile, Alabama on 14 September, two manufacturers are again producing commercial aircraft in the USA for the first time since McDonnell Douglas merged into Boeing in 1997.

Though production volumes still heavily favour Boeing's output in Seattle and, more recently, North Charleston, South Carolina, Airbus can now stand on US soil as a major manufacturer of one of the world's most visible products – the A320 aircraft family.

"Airbus is now truly an American manufacturer," says Airbus president and chief executive Fabrice Brégier, addressing an audience of local and state dignitaries, employees and press gathered inside Mobile's "Hangar 9" final assembly hall.

The Mobile site serves two main purposes in Airbus's global growth strategy. First, it provides a fourth final assembly line to accommodate an unprecedented delivery ramp-up, and second, it is a local stage for delivering aircraft to what remains the world's largest market for single-aisle airliners.

A new factory also adds to Airbus Group's growing corporate presence in the US market. Though denied a coveted opportunity to produce 179 A330 tankers for the US Air Force in Mobile, the company continues to deliver UH-72A Lakota helicopters to the US Army from a factory in adjacent Mississippi.

LOOKING SOUTHEAST

It also contributes to a blossoming multi-state cluster of aerospace factories that has emerged in the US southeast over the past decade. As Airbus has focused on Alabama and Mississippi, Boeing has been assembling 787s in South Carolina since 2011. Meanwhile, Embraer is bringing Legacy 450 and 500 final assembly next year to Melbourne, Florida, where it already makes Phenom 100 and 300 jets. HondaJet is expected to start delivering a certificated entry-level business jet from North Carolina by the end of this year, and Bell Helicopter will build the 505 light helicopter in Louisiana.

Such growth, fuelled by the region's paltry union presence and wealth of logistics infrastructure, is extending slowly through the supply chain. In Mobile, for example, Hutchinson Aerospace is building a factory to supply thermal and noise insulation for locally built A320s and 787s.

For Airbus, however, Mobile represents an interesting test case for how far it can extend its strategy of dispersing a portion of highly visible final assembly operations to foreign sites while keeping more labour-intensive

Airbus

JetBlue will receive an initial A321 from the site in mid-2016

AUTHORISATION

Audit key to keeping commonality

A team of European regulators is due to arrive imminently in Mobile, Alabama, to audit Airbus's new A320 facility to allow it to preserve production commonality with its existing sites.

The audit by the European Aviation Safety Agency is required to extend Airbus' existing authorisation for A320 production lines in Toulouse, France and Hamburg, Germany, to the US plant.

Extending an existing EASA certificate to a new site means the Mobile facility can keep its production process identical to operations in Europe.

Its alternative is to request a production authorisation from the US Federal Aviation Administration, but small differences in the regulations between the FAA and EASA would require minor but meaningful changes to the production operations. The FAA accepts all aircraft produced under EASA-approved production certificates.

The two agencies already agree on how to implement an EASA certificate for the A320 line in Mobile. An agreement signed last year requires the EASA audit teams to share their findings with FAA officials. Likewise, the FAA has agreed to perform inspections on behalf of its European counterpart. ■

Boeing touts F-15C improvements
DEFENCE P16

Two A321s are currently being assembled, with flights due in early 2016

Airbus

major component assembly jobs confined mostly within Europe.

Airbus clearly designed the Mobile site with plenty of extra space to support potential growth. Adjacent to a deepwater port and a seldom-used, 3,050m (10,000ft) runway, the Airbus complex now occupies a 160-acre lot. Airbus also leases another equally-sized plot of undeveloped land on the site with no announced purpose.

"Mobile is our industrial home," says Alan McArtor, chief executive of US-based Airbus Group Inc. "We have enough real estate under lease with the Mobile airport authority to expand. We have no direct plans. It certainly is a capability we can do in the future. It is not likely at all that we would try to find some other state to go to. This is our home right here."

The grand opening on 14 September in Mobile revealed an almost exact copy of the company's Hangar 9 final assembly hall in Hamburg, Germany, with plenty of room to grow well beyond the plan to reach four aircraft deliveries per month from Mobile by the end of 2017.

Two shipsets of A320 assemblies have already arrived in Mobile since June, filling two of the four stations in the final assembly. The first aircraft in assembly, a JetBlue A321, will within two weeks arrive at the Station 40 wing-to-body join. The fuselage for an American Airlines A321 is sitting behind in Station 41. Both aircraft could fly in the first quarter of 2016, with deliveries beginning in the following quarter.

The production system is identical to the process used at the other three A320 plants with one key change. Airbus is qualifying an automated drilling machine at the wing-to-body join position, replacing a manual process to drill about 2,400 holes where the sections meet. If the automated system works, Airbus plans to retrofit the other A320 assembly lines with the same technology.

GROWING APPETITE

By the end of 2017, Airbus expects to reach the planned production rate of four aircraft per month, supplying hungry demand from US carriers for the twin-engined narrowbody and contributing a critical piece of a plan to achieve a monthly production rate of 50 aircraft.

Whether the Mobile site continues to grow beyond that point is still open to question, as a debate forms between Airbus executives in Europe and the USA.

There is no question that the Mobile site has the capacity to continue expanding. With relatively minimal capital investment, such as adding shifts and building a new paint hangar, Airbus could double the capacity of the existing facility. Even the Honeywell-built power plant for the Mobile site is sized to support a monthly production rate of eight aircraft.

> **"We have enough real estate under lease with the Mobile airport authority to expand"**
>
> **ALAN MCARTOR**
> Chief executive, Airbus Group Inc

In Europe, however, Airbus executives are considering increasing the overall production rate of A320s to up to 60 aircraft per month after 2017. If such a ramp-up is needed to be achieved rapidly, Brégier says the quickest option is to create a new assembly line in Hamburg, negating the need to expand capacity in Mobile.

However, in a separate interview, McArtor says he disagrees that Hamburg would be the preferred option if a rapid ramp-up is required.

"I don't know that that's necessarily true," McArtor says.

In theory, it would also be possible to increase A320 capacity beyond four aircraft deliveries a month in Mobile by decreasing capacity elsewhere.

Asked if such an option would be considered, however, Brégier was clearly uninterested. "Why would we do that?" he asked. The Mobile site was created to contribute to the production ramp-up, not offset capacity already in the system, he adds. ■

Airbus

In expanding to Mobile, Airbus must balance keeping more labour-intensive jobs confined to Europe

SURVEILLANCE **JAMES DREW** WASHINGTON DC

Lockheed Martin unveils TR-X as U-2 successor

Lockheed Martin Skunk Works' proposal for an optionally-manned successor to the U-2 surveillance aircraft has morphed into a concept dubbed "TR-X".

The company released a notional artist's impression of the intelligence, surveillance and reconnaissance aircraft at an Air Force Association event in Washington DC.

U-2 business development manager Scott Winstead says the new designation is intended to more closely reflect the aircraft's potential role. "If it's something that's going to be a workhorse with the latest in technology and platform design, you're more talking tactical rather than strategic reconnaissance," he notes.

The company's concept is for a low-observable aircraft optimised to fly at 70,000ft, and with the same General Electric F118 engine that powers the U-2 today. It would have increased power and cooling to accommodate new sensors, communications and electronic warfare equipment, and perhaps offensive or defensive laser weapons.

Lockheed Martin

Service entry is eyed for 2025

Winstead imagines a fleet of about 25 to 30 aircraft. It currently takes five U-2s or three unmanned Northrop Grumman RQ-4 Global Hawks to maintain one 24h surveillance orbit.

The TR-X could be ready for service around 2025, Lockheed says, and if the concept resonates with the USAF it will be pitched as an unsolicited proposal.

"The design has got to sell itself," Winstead says. ■

Boeing

Boeing is targeting current operators such as Israel, Japan and Saudi Arabia

COMBAT AIRCRAFT **JAMES DREW** WASHINGTON DC

Boeing touts F-15C updates

Enhancements based on Silent Eagle concept double missile payload and add AESA radar

Boeing has unveiled a proposed update to its F-15C fighter which is designed to keep the type operationally relevant through 2040.

Called 2040C, the upgrade package includes "quad pack" munitions racks which would double the aircraft's air-to-air missile payload to 16, and conformal fuel tanks for extended-range flights. It also features Raytheon's APG-63(V)3 active electronically scanned array radar, a long-range infrared search and track sensor, Northrop Grumman's EPAWSS electronic warfare system and the "Talon HATE" system, which will connect the F-15 with the US Air Force's Lockheed Martin F-22s.

Boeing vice-president of F-15 programmes Mike Gibbons says the 2040C concept is an evolution of the Silent Eagle model proposed to South Korea, with some low-observable improvements but mostly a focus on the latest air capabilities and lethality.

"F-15s and F-22s in the fight together out there in the 2030s; the assessment and analysis we've done points to this as a nice solution set for the air force," Gibbons said at an Air Force Association conference in Washington DC.

"The air force has funded some of these and we're in discussions about the others." He adds: "Doubling the number of missiles on the jet is not something that's a current programme of record, but it is something we know is of interest to the air force."

Boeing sees a market for more than 200 active-duty and Air National Guard F-15C upgrades, and the new payloads could be delivered as part of a future service life-extension programme. Some of the USAF's examples have more than 20,000h of airframe life remaining, whereas others are in the "low teens", and would require new wings and vertical tails.

Air Combat Command commander Gen Herbert Carlisle says the F-15C will require a life-extension programme in the near future, and that the extra capabilities being offered by Boeing will be considered. The upgrade would have a "significant bill", but Carlisle says planning needs to start now.

Boeing is also targeting international F-15 operators, including Israel, Japan and Saudi Arabia. ■

PROGRAMME
JAMES DREW WASHINGTON DC

USAF Pegasus tanker ready to take to the skies

The first functional tanker from the US Air Force's Boeing KC-46A programme should make its debut flight on 25 September, according to the service's programme executive officer for tankers.

Despite an almost one-year schedule delay, Brig Gen Duke Richardson said in mid-September that the programme's second engineering and manufacturing development aircraft, EMD-2, was in the fuel dock, after preparations for the first flight were paused for 30 days after a chemical mix-up contaminated the integrated fuel system.

Speaking at an Air Force Association event, Richardson said: "We're not struggling in terms of capability", adding that Boeing remains committed to delivering the first 18 aircraft by August 2017.

Richardson says the first KC-46A is expected to start passing fuel in January or February 2016, and that it will refuel the Fairchild Republic A-10, Lockheed Martin F-16, Boeing AV-8B, C-17 and another KC-46A.

A "milestone C" production decision is expected in April 2016, and two contract awards for low-rate initial production will follow in quick succession; respectively for batches of seven and 12 aircraft. ■

Maritime patrol is a 'key capability'
SHOW REPORT P18

UPGRADE **BETH STEVENSON** HOLLOMAN AFB

German Tornados get breath of new life

First five US-based aircraft are refreshed with new avionics and JDAM weapons, simulator modifications to follow in 2017

Deliveries of upgraded Panavia Tornados to the German air force's training wing at Holloman AFB in New Mexico are underway, with five modified examples from the 15 aircraft based in the USA delivered to date.

Under the Avionics System Software Tornado Ada (ASSTA) 3.0 programme, the air force's Tornados are receiving new avionics, radios and digital video and voice recorders, plus integrated Boeing laser JDAM weapons. The work is being carried out by Airbus Defence & Space.

Astrid Burger-Weber/German air force

Some 1,700 sorties in 2014

The German air force will upgrade 85 of its Tornados to the latest ASSTA standard.

A first delivery of a modified Tornado to the air force was made in Germany in 2012, and the last to be prepared for the overseas training wing is due to be completed next year.

LIVE FLYING

The first two Holloman aircraft were delivered earlier this year, with three more exchanged in early September in Maine and the next batch expected in early December. Its detachment comprises six trainers and nine interdictor/strike-standard aircraft.

"There were no problems, and we were done within two days," Lt Col Thorsten Weber, commander of the German air force logistics group at Holloman, said of the recent delivery during a media briefing at the base on 9 September.

The training at Holloman involves simulator-based instruction provided by CAE, supported by Thales, in addition to live flying.

While the deliveries of the ASSTA 3.0 Tornados will be completed to Holloman in mid-2016, the upgrade to the simulator will lag behind the modifications by approximately a year.

Astrid Burger-Weber/German air force

Deliveries of the modified Tornados will be completed in mid-2016

The training device is expected to be shut down in October until December for a first round of upgrades, which will eventually see both simulator cockpits changed. Four German Tornado simulators, including those located in Germany, will be modified.

Last year saw 24 pilots and 20 weapons system operators graduate from the training programme at Holloman, while 2,250 flight hours and 1,700 sorties were flown. Weber says this will be replicated in 2015. Some 70% of sorties are flown with weapons, with 14,500 rounds fired last year and 1,200 bombs dropped.

The ASSTA upgrade will extend the life of the Tornado fleet to 2025, although the basing at Holloman will expire in 2019. Following this, it will be renewed on a year-by-year basis.

"We will need the Tornado for far more than a decade," Weber says. "However, this will probably be the last upgrade to the Tornado." ■

MILESTONE **DOMINIC PERRY** LONDON

Enhanced L-39NG trainer makes maiden sortie

Aero Vodochody made the first flight with an updated L-39NG trainer from its Odolena Voda facility in the Czech Republic on 14 September.

Enhancements include a new Williams International FJ44-4M engine, Genesys Aerosystems avionics and head-up displays from Speel Praha. The wings have also been modified, with the wing-tip fuel tanks on earlier generations of the Albatros replaced with new composite structures.

Company president Ladislav Šimek says the flight came just three weeks after it received the aircraft's engine. "By using the best available components, we have brought to the market an unprecedentedly effective type of aircraft, accessible to a broad spectrum of users," Šimek says.

Aero Vodochody plans to demonstrate the L-39NG to NATO service chiefs at an event in Ostrava late this month. ■

Aero Vodochody

Update has an FJ44-4M engine

DSEI 2015

The tri-service Defence & Security Equipment International (DSEI) exhibition took place in London's Docklands from 15-18 September, attracting more than 1,500 exhibitors from around the globe, plus service chiefs and defence ministers from host nation the UK.

Among the key topics were a pending defence review and the need for a maritime patrol aircraft capability, plus advances in unmanned systems projects.

Show report by Craig Hoyle, Dominic Perry and Beth Stevenson

Guy Bell/Rex Shutterstock

REQUIREMENT

Maritime patrol is a 'key capability'

Defence secretary says strategic review will "look at" lapsed capacity as companies offer proposals for anticipated need

The UK's continuing Strategic Defence and Security Review process has identified the lack of a maritime patrol aircraft (MPA) capability as a key area of consideration, defence secretary Michael Fallon says.

"Maritime patrol was one of the gaps in the last review [and] one of the capabilities we had to forego," Fallon said at the show on 16 September. "It will be one of the key capabilities we will look at as we get to the end of this review."

Fallon says the SDSR results will be released later this year, "but we're not yet at the stage at which we have to take decisions."

Lockheed Martin used the show to propose adapting 10 of the Royal Air Force's C-130J tactical transports to an MPA or multi-mission aircraft (MMA) configuration, with Marshall Aerospace as its conversion partner.

The work would incorporate a mission system similar to that on the Royal Navy's AgustaWestland Merlin HM2 helicopters, but with five operator stations. The Hercules also would gain an active electronically-scanned array radar, weapons sponsons in front of the main landing gear for torpedoes, and under-wing pylons to carry anti-ship and air-to-surface missiles. Additional fuel tanks would increase endurance to 14h, and the SC-130J would be able to fly 1,000nm (1,850km) and remain on station for more than 6h without air-to-air refuelling.

The proposal also involves giving the aircraft replacement centre wing boxes, which Keith Muir, international business development manager for Lockheed Martin UK Integrated Systems, says could enable a service life of another 25 to 30 years. Lockheed says operational capability is possible before 2020.

Airbus Defence & Space has cautioned against the Ministry of Defence acquiring the Boeing 737-based P-8 without a competition, claiming that its C295 could be acquired for one-third of the cost.

Airbus – which made an unsolicited offer to the MoD in June 2014 – is proposing supplying 12 C295s equipped with weapons and sonobuoys already in the UK military inventory.

Lockheed Martin

Lockheed Martin proposes adapting 10 of the RAF's C-130J tactical transports

Brian Burridge, vice-president strategic marketing at Finmeccanica UK, believes the Alenia Aermacchi C-27J could perform a variety of duties for the RAF, including maritime surveillance.

An MMA offer to the UK would include a maritime search radar and mission system equipment from Selex ES, and air-launched weapons from MBDA, potentially including the Brimstone air-to-surface missile, and could also fill a future airlift gap between the Airbus A400M tactical transport and Boeing CH-47 Chinook transport helicopter.

L-3 Mission Integration, meanwhile, has led the design of a candidate based on the Bombardier Q400, and a test aircraft is now ready for adaptation by Canada's Cascade Aerospace. Dubbed the Q400 MMA, the platform will carry an additional 4,540kg (10,000lb) of fuel, and have a bomb bay for torpedoes.

"We will start flight testing next year," says Nicholas "Flash" Gordon, director international programmes for L-3 Mission Integration. L-3 will provide a mission management system already operational on some Lockheed P-3 Orions, radar and electronic warfare equipment from Selex ES and acoustics from Ultra Electronics Sonar Systems.

Gordon says the modified type will be able to fly 800nm and remain on station for more than 4h,

After a first conversion at its Greenville ,Texas, site, the remainder of a roughly 12 aircraft fleet would be modified in the UK.

Saab is promoting the capabilities of its Saab 2000-based Swordfish MPA, while Northrop Grumman believes that the UK requirement could be partially filled using its MQ-4C Triton high-altitude, long-endurance unmanned air vehicle, operated in conjunction with the P-8. ■

Watchkeeper to gain export appeal
SHOW REPORT - P20

ROTORCRAFT

Puma HC2s may soldier on until 2035

Study proposes 10-year service extension for RAF transport helicopters to harmonise out-of-service date with navy's Merlins

UK service officials are contemplating extending the operational life of the Royal Air Force's Airbus Helicopters Puma HC2 transports beyond their current 2025 retirement date, as they eye the possibility of an eventual replacement.

Contained in a draft study produced by the nation's Joint Helicopter Command (JHC), the proposal could see the 24-strong inventory performing frontline missions until 2035. This would align with the planned out-of-service date for the Royal Navy's AgustaWestland AW101 Merlin HM2 and HC4 fleets, and allow the Ministry of Defence to replace all of its medium helicopters with a common platform.

Speaking at a pre-show conference on 14 September, Maj Gen Richard Felton, commander of JHC, said the Future Capability Study identified "an enduring need" for C4ISR and attack platforms in the period from 2045 onward, "and it references a need for medium-lift capability".

Crown Copyright

Airbus Helicopters recently completed upgrades of the Puma fleet

Stressing that no decision on the future force has yet been taken, Felton says the document will be presented to "the chain of command" in the coming months.

"We may look at the out of service dates and harmonise those," he notes.

The UK has completed upgrade programmes to take the Puma and Merlin to their respective HC2 and HM2 standards, with a separate effort to convert former RAF Merlin HC3/3As to a navalised HC4/4A model under way.

Although the Puma HC2 – which has received a digital cockpit and uprated Turbomeca Makila 1A1 engines – is presently due for retirement in 2025, an extension is well within its capabilities, says Air Cdre Simon Moss, director helicopters at the UK's Defence Equipment and Support organisation.

"So long as it is not too far we could do it without a great deal of extra investment," he says. "But if you said 'punt it out to 2050' then that's a different question."

Felton says the JHC is watching the helicopter industry in both the USA and Europe to "identify what future opportunities exist" for an eventual replacement of both platforms. ■

DEMONSTRATION

UK's RWUAS concept proved in trials

AgustaWestland has revealed the results of the live trial phase of the UK Royal Navy's rotary wing unmanned air system (RWUAS) capability concept demonstration (CCD) programme.

The evaluations, contracted to the airframer in 2013, took place in May at Llanbedr airfield in Wales, with the PZL Swidnik SW-4 Solo optionally-piloted helicopter carrying out 26 flights totalling over 27h, with 22 further simulated ship launch and recovery demonstrations to highlight the ability of the UAV to land on a pitching and rolling surface.

The CCD effort was delivered on time and on schedule, Tony Duthie, head of market development for AgustaWestland, notes, and shows how the control system of the Solo could be integrated with a ship's combat management system for potential future operations.

Points of interest were uploaded to the control station, and the Solo then followed the generated tracks.

AgustaWestland says that it brought autopilot, flight control, stabilisation and datalink experience from its manned rotorcraft business to the development.

While there is no clarification on what the navy intends to do following the completion of the CCD, Duthie says there is little value in carrying out the development unless it can be exploited from a business perspective, and that AgustaWestland plans to continue to hone the technology.

"There are a number of initiatives going forward," he says. "An unmanned Joint Warrior exercise is planned for 2016, and it is our intention to participate in that." ■

AgustaWestland

An unmanned PZL Swidnik SW-4 Solo helicopter made 26 flights

CONTRACT

Raytheon adds penetration to Paveway IVs

Raytheon UK has been awarded a £25 million ($38.5 million) contract to complete the development and qualification of a new penetrator warhead to equip the 226kg (500lb) Paveway IV precision-guided bomb, for carriage by the Royal Air Force's Eurofighter Typhoons.

To replace the larger Paveway III currently deployed from the RAF's Panavia Tornado GR4s, the new system will enter service with the Typhoon in 2019. A separate award with BAE Systems will cover integration and the potential use of a dual-round launcher.

John Michel, weapons business director for Raytheon UK, says the Rheinmetall Italia-produced tactical penetrator warhead will be similar in performance to the BLU-109 used with the Tornado's current weapon. ■

PROCUREMENT

Watchkeeper to gain export appeal

Customer demand for greater sovereign control prompts Thales to introduce variant of WK450 with four new modules

Thales has introduced a new concept to sell its Watchkeeper unmanned air vehicle to export markets.

The British Army is the sole operator of the WK450 Watchkeeper, but Thales is offering the "WK X" to France and Poland for their tactical UAV requirements.

"One product for the whole market will not be the solution," says Pierre-Eric Pommellet, executive vice-president of defence mission systems at Thales. "We have decided to invest in a new approach."

WK X involves taking the Elbit Systems Hermes 450-derived WK450 and adding four different modules – mobility, sensors, exploitation, and effectors. With customers demanding more sovereign control, these would allow in-country supply chains to be incorporated into export programmes.

Guy Bell/Rex Shutterstock

France is in the process of assessing bids for a 14-aircraft order

France is in the process of choosing between two bids – thought to be the Watchkeeper and Sagem's Patroller system. Thales submitted its final bid to the nation's defence ministry in September, following a series of Watchkeeper flight trials in Wales in June. It is understood that Paris requires 14 aircraft in total.

Poland has not yet released an official tender for a tactical UAV, but is understood to be in discussions about its requirement. A request for information was issued in 2014, but parliamentary elections in October will push back the release of a request for proposals until the following months.

Warsaw's procurement process is still not clear. It could be an open tender, commercial off-the-shelf sale, or a government-to-government deal. There is also the possibility that the government will require a Polish prime contractor.

Poland wants an armed tactical UAV, so weapons would need to be integrated into the Watchkeeper. Thales' free fall lightweight multi-role missile is an option, but Matt Moore, head of Thales UK's UAV business, says this will not be tested on board Watchkeeper until a customer requires it. ■

WEAPONS

Turkish SOM-J cruises onto F-35 variants

Lockheed Martin and Turkish guided weapons manufacturer Roketsan plan to flight test a SOM-J cruise missile on a Turkish air force Lockheed F-16 fighter in 2017, ahead of its integration on the company's F-35.

Adapted from the larger SOM weapon already integrated with the F-16 and McDonnell Douglas F-4, the SOM-J should be available for internal carriage by the conventional take-off and landing F-35A and carrier variant F-35C as part of the type's Block 4.2 software standard, says Lockheed.

"Our goal is to make this one of the weapons of choice for the F-35," Rick Edwards, executive vice-president for Lockheed Martin Missiles and Fire Control, said after a signing ceremony at the show. Lockheed also will "actively support selling this to the USA," he adds. ■

EQUIPMENT

Striker II testing completion in sight

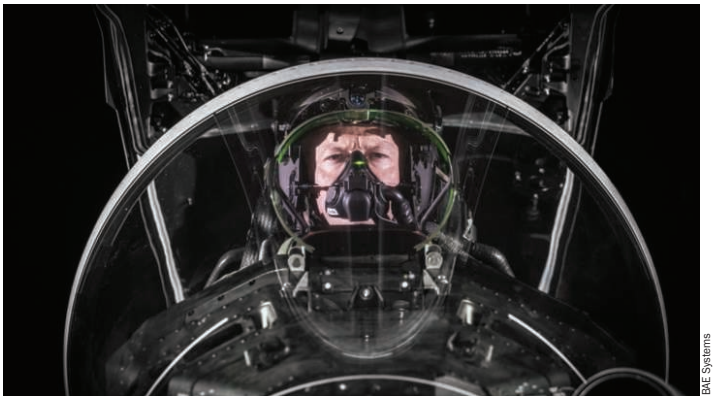
BAE Systems has implemented a number of modifications to its Striker II helmet-mounted display (HMD), following night trials with a Eurofighter Typhoon earlier this year.

Conducted in May, these formed part of the development effort, and were intended to validate the design's night vision capability. Launched at the Farnborough air show in 2014, the new helmet is a digital upgrade to the model currently used by Typhoon pilots.

Four flight tests were carried out using a two-seat, Tranche 1 Typhoon, and followed a series of ground trials on the Striker II.

The optical performance, image clarity, lighting and symbology were evaluated, as were the controls and displays, workload, and any physiological effects.

BAE test pilot Peter Kosogorin says that while the objectives were "very ambitious", the testing went well. Overall the company is pleased with the results, he says, believing that it reduces the workload for the pilot.



BAE Systems

Development effort aims to validate design's night vision capability

However, Kosogorin says the test conditions were not ideal, as they were carried out with some ambient light present. Also, there was an image overlay issue that caused duplicates, but this was rectified following the testing.

"There was a higher latency than expected, but it was good that we found it and fixed it almost straight after the trial. We didn't anticipate some issues, but having early access to these means we've already incorporated them into the design."

Full moving symbology was not tested, but this will be in the next, and final, set of trials that are expected to take place "at the turn of the year". These will involve connecting the digital HMD with the aircraft's avionics. ■

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BOEING

DEVELOPMENT
KATE SARSFIELD LONDON

Flight-test article for Global 7000 near completion

Bombardier's first Global 7000 flight-test aircraft, FTV1, is taking shape at the company's facility in Toronto, Ontario. A pair of GE Passport engines have been mounted on the ultra-long-range prototype, Bombardier announced on 14 September, adding that the aircraft is now structurally complete and functional test procedures have begun.

The second test aircraft, FTV2, is also in final assembly, Bombardier says. Its major structural components are joined, including the rear, centre, and forward-fuselage sections and cockpit. Two additional flight-test vehicles are in various stages of production and assembly, the airframer adds.

The Canadian company will not disclose when the 7,200nm (13,500km) range twinjet will make its first flight, but it has pegged service entry for the second half of 2018. The aircraft's 7,900nm-range stablemate, the Global 8000, is scheduled for delivery around 12 months later. ■

Charter firm Zenith has orders and options for eight Avanti Evos

Piaggio Aerospace

CHARTER **KATE SARSFIELD** LONDON

Zenith poised for Evo arrival

UK launch customer for upgraded Piaggio twin-pusher expects delivery by early December

Zenith Aviation, the UK launch customer and distributor for the Piaggio Avanti Evo, is preparing to take delivery of its first aircraft in early December and hopes to begin exercising its options for the twin-engined turboprop by the end of September.

"We will be taking serial number seven," says Zenith managing director Stuart Mulholland. "It will be the first aircraft to roll off the assembly line at Villanova d'Albenga," he adds.

That location is the Italian airframer's new base and replaces its more-than 90-year-old plant in Finale Ligure, Genoa, which is being turned into a dedicated service centre for the Avanti fleet.

Zenith is the first UK-based charter operator to buy the twin-pusher. The Biggin Hill-based company has one firm order and seven options for the Evo, which is the third iteration of the P180.

The aircraft will join Zenith's five-strong fleet of owned and managed business jets, which includes a superlight Cessna Citation XLS and a large-cabin Bombardier Challenger 604.

The $7.4 million Evo was launched in May 2014 as an upgraded and higher performance version of the 10-year-old Avanti II. Its refinements include a revamped and quieter interior, new landing gear, winglets, redesigned engine nacelles, a reshaped front wing and five-blade composite scimitar propellers.

Piaggio secured European certification for the Evo in December 2014 and the first aircraft was handed over to Greek charter operator Superior Air Services in April. The company – owned by Abu Dhabi investment house Mubadala – plans to deliver a dozen Evos by the end of 2016. ■

PROMOTION **KATE SARSFIELD** LONDON

Cessna targets Latitude at Europe as tour begins

Cessna has begun a European demonstration tour of its new Citation Latitude with the annual Business and General Aviation day (BGAD), held on 15 September at London Biggin Hill airport, the first stop on its three-week multi-city itinerary.

The $16.3 million, midsize business jet is the newest aircraft in Cessna's 16-strong range. It secured Federal Aviation Administration certification in June after a three-and-a-half year development effort, and entered service with a US owner in August.

The Textron Aviation subsidiary now anticipates European validation for the nine-seat aircraft in the fourth quarter. "We are eager to get the Latitude approved in Europe so we can begin deliveries to our customers here," says Textron Aviation's vice-president of sales for Europe, Tom Perry.

Europe is one of the largest markets for the Citation business jet family with an inventory of around 830 aircraft, according to Flightglobal's Fleets Analyzer database. The airframer expects much of the demand to come from existing Citation owners "moving up or moving down" the family or upgrading to the latest model. Fleets Analyzer records the average age of the European Citation fleet at 13 years.

The Latitude is positioned in the nine-aircraft Citation family between the $12.7 million superlight XLS+ and the $17.9 million midsize Sovereign +, sharing its wing, Pratt & Whitney Canada PW306D engines and a Garmin G5000 flightdeck.

"The Latitude is unique in the Cessna product line, with its flat floor and sector-leading 1.83m [6ft] high, 5ft-wide cabin. We expect it take the midsize market by storm," Perry adds.

Perry also dismisses the threat posed by its nearest competitor, the Embraer Legacy 500, which has a head start on the Latitude after entering service in Europe in May. "We don't worry about the competition. We will let the customers make their choice," he says. ■

Life Photography

European validation for the midsize jet is expected before year-end

Smooth operator
FEATURE P26

SAFETY ALEXANDER ZUDIN LONDON

'Concern' over Russian pilot training

Recent crashes lead federal aviation regulator to call for tighter requirements and installation of collision warning systems

Russia's federal aviation regulator (Rosaviatsia) is concerned over the level of training of general aviation (GA) pilots in Russia and wants more transparent training, as well as mandatory fitting of collision avoidance systems, the agency's deputy director Oleg Storchevoi says.

"We're very concerned at the level of training of general aviation pilots. We've repeatedly said that we need not to tighten up the requirements for pilot training, but make it clear and understandable, so there is a way to control its functioning," he said at a meeting in the Moscow City parliament on 8 September.

Rosaviatsia does not have the capability to monitor the training process for GA pilots or to control the issuing of licences, Storchevoi says, adding the agency wants mandatory fitting of collision warning systems in GA aircraft.

"There are no such requirements [to fit collision warning] and there should be," he says. "Yes, this will be an additional expense for aircraft users. But I think it's hard to put extra costs on the same level as human life."

The call for increased regulation follows a spate of recent crashes, including a mid-air collision near Moscow on 8 August involving a Cessna 206 floatplane and a Robinson R44 helicopter, in which nine people were killed.

General aviation has boomed in the last decade in Russia, but many GA pilots there have criticised a lack of regulation. Many Interstate Aviation Committee accident reports on incidents involving light aircraft in Russia in that period cited infractions of the rules, with pilots having lapsed licences or medical certificates, invalid airworthiness documentation, or no such documentation.

Accidents have also involved GA pilots flying while under the influence of alcohol. ■

PROGRAMME KATE SARSFIELD LONDON

Bell pushes Jet Ranger X into Poland

Bell Helicopter has continued its sales push for the developmental 505 Jet Ranger X, displaying a mock-up of the light single-engined rotorcraft at the MSPO defence show held in Kielce, Poland between 1-4 September.

Bell says it exhibited the four-seat, civil rotorcraft at a military exhibition "to promote its capabilities as a training platform" for the region's air forces.

The mock-up was also displayed to Polish civilian operators between 14-17 September at a private facility near Warsaw owned by Bell's distributor for the country, JB Investments.

Poland is regarded by the airframer as a potentially lucrative market for the multi-mission aircraft, which is earmarked for service entry next year.

Bell Helicopter

A mock-up was shown to civil and military operators in Kielce

Bell has over 350 tentative orders for the Garmin G1000H-equipped, Turbomeca Arrius 2R-powered 505, including more than 55 letters of intent from European customers, says Bell. The airframer is now reaching the final stages of the Jet Ranger X's flight-test programme and is on track for year-end certification.

As of early September, the first prototype, FTV1, had notched up more than 250h since entering use in November 2014. It completed hot temperature and high altitude testing a month ahead of schedule, says Bell, and will wrap up certification testing early in the fourth quarter following a 100h endurance ground run.

FTV2, meanwhile, has clocked up around 60h of load, fatigue and cold weather testing since entering the certification programme in February.

The final flight-test aircraft, FTV3 – which performed its maiden sortie in July – has been testing the Jet Ranger X's noise and handling qualities. This aircraft will later be used for function and reliability testing. It has so far accumulated around 20h. ■

MANUFACTURING KATE SARSFIELD LONDON

Icon A5 production shifts to new Solano facility

US light sport aircraft (LSA) manufacturer Icon has begun transferring the manufacture of the A5 amphibian from its current base in Tehachapi, California to a new facility, 340miles (550km) away in Vacaville, near San Francisco.

A few aircraft will roll off the production line later this year, and Icon plans to reach full-scale production by early 2018. The 10-year-old company handed over the first version of two-seat LSA in July at the AirVenture show in Oshkosh, and is gearing up to deliver the second from the Tehachapi site shortly. The following units will then be delivered from the new facility, which will also replace Los Angeles as the company's operational headquarters.

So far Icon has received around 1,500 orders for the 100hp (74kW) Rotax 912iS-powered A5. It plans to deliver up to 40 by the middle of next year, ramping up to 100 over the next 18 months and 600 aircraft after 30 months. ■

INCIDENT DAVID KAMINSKI-MORROW LONDON

Norway frets after UAV hits light aircraft

Norwegian investigators have revealed that a light aircraft collided with an unmanned air vehicle just days before the country's air navigation service cautioned about their proliferation.

Investigation authority SHT declines to identify the aircraft type involved, but says it was a "low-wing, two-seat" monoplane.

The incident took place on 30 August at around 19:00 just north of Vasser, a district near Sandefjord, south of Oslo. SHT says the collision occurred at around 2,500ft. "The pilot encountered what is believed to be a drone and … heard a bang," it states.

The flight continued without any technical problems and an inspection after landing revealed no evidence of damage. SHT says the pilot assumes the drone struck the aircraft's left-hand landing-gear.

It wants the operator of the drone – or anyone who finds the wreckage – to contact investigators. "Lately there have been several potentially-dangerous incidents around the world," it states.

Norway's civil aviation authority says that drones should not be flown at a height exceeding 410ft. ■

SMOOTH OPERATOR

Embraer's first E190-E2 is moving swiftly through the maze of hangars at São José dos Campos, as automated manufacturing takes hold

STEPHEN TRIMBLE SÃO JOSÉ DOS CAMPOS

A well-practiced industrial choreography is being repeated this autumn within Embraer's E-Jet manufacturing base in São José dos Campos, Brazil. This time the dance involves the first copy of an improved new product – the re-engined and re-winged Embraer 190-E2 – moving through the final stages of the E-Jet family's newly-revamped production system.

When Embraer brought the original E-Jet family into production 15 years ago, it re-used many of the same facilities that were built in the 1970s to produce a series of small regional turboprops and, later, regional jets. The arrangement served to minimise the company's capital investment as it embarked on a new family of large regional jets and now accommodates a rejuvenation of both the product and the production process.

Like the original E-Jet series, the E190-E2, then the E195-E2, and finally the E175-E2, will pass through the same maze of hangars in Embraer's production system, but this time a formerly manual process will be heavily automated.

The first E190-E2 fuselage has recently completed assembly in the same F-60/1 building along a line parallel to the original E-Jet, with automated drilling machines replacing manual labour.

Meanwhile, the larger, modernised wings for the same aircraft have also completed assembly in a newly-automated drilling and riveting line in the F-107/1 hangar. Both wing sections will now be mated to the fuselage in the F-107/2 bay, before the almost-completed aircraft is towed to the cavernous F-220 building for final assembly. There, workers will attach a pair of Pratt & Whitney PW1900G geared turbofan engines to strengthened wings and complete systems and interior installation within the fuselage.

"We are progressing very well," says Luis Carlos Affonso, Embraer's senior vice-president of operations and chief operating officer. "We are very happy with the physical progress."

It has been nearly four years since Embraer committed to launch the E2 aircraft family, shortly before the Dubai air show in 2011. The Brazilian manufacturer's announcement came less than three months after Boeing launched the 737 Max programme, which followed Airbus' lead with the A320neo concept. Both commercial aircraft titans had decided to re-engine rather than replace their still-popular narrowbody stars with a presumably larger family of new aircraft.

To Embraer, those decisions seemed to leave the company with little choice. Rather than develop a new aircraft optimised to occupy the 110- to 150-seat space once expected to be vacated by Airbus and Boeing, it instead launched a programme to re-engine, re-wing and in some cases stretch the largest three of the E-Jet family's four variants.

Not surprisingly, the E2 development process is so far following a similar timeline to the 737 Max. Boeing introduced the first 737 Max 8 into final assembly in Renton this month, around the same time as the first E190-E2 was moved into the fuselage-and-wing hangar in São José dos Campos. The timelines begin to diverge starting next year, with the 737 Max entering service in 2017 and the first E190-E2 to be delivered in 2018.

> **"We are progressing very well. We are very happy with the physical progress"**
> **LUIS CARLOS AFFONSO**
> Senior vice-president of operations, Embraer


First E190-E2 fuselage assembled
Embraer

Delivery of the new variant will occur during 2018
Embraer

The difference in timing is explained by the complexity of Embraer's project. Though stopping short of a risky, clean-sheet development activity, Embraer accepted a far more challenging work statement for the E2 project than Airbus and Boeing adopted for their purely re-engined models.

First, Embraer's programme would require two major engine variants: the PW1700G for a stretched E175-E2, and the PW1900G for the E190-E2 and stretched E195-E2 (the original E-170 was dropped in the E2 series).

All-new wings also would have to be developed for the E175-E2 and E190/195-E2. Perhaps most ambitiously, Embraer also decided to apply a full fly-by-wire system in the smallest commercial aircraft to date, with the 78-seat E175-E2 extending a progression of innovation beginning with the 125- to 240-seat A320 family, 110- to 160-seat Bombardier CSeries family and the 95-seat Sukhoi Superjet.

SUCCESSFUL STRATEGY

That combination of new engines, new wings and a full fly-by-wire system has proved already successful in the market. Since 2008, Bombardier has managed to attract only 243 firm orders for both variants of its CSeries. But while Embraer started accepting orders for the E2 aircraft family only two years ago, it has already collected 325 firm orders. The backlog also shows a comfortable balance, with 150 total orders by two customers for the E175-E2, 85 orders from four customers for the E190-E2 and 90 orders from four customers for the E195-E2.

"We are very glad with the way the family is laid out. You can see that in our orders. We have basically orders for all types – the 175,

190 and 195," Affonso says. "We believe there will be applications for all three models."

Embraer's task now is to keep the programme on schedule, so the ramp-up of E-190-E2 deliveries in 2018 allows a smooth transition from the E1 programme.

Assembly of the structure of the first aircraft at the São José dos Campos factory is a critical part of the programme, and so is another operation taking place about 17km away, at another Embraer facility in Eugênio de Melho. It is here that Embraer is assembling and testing the avionics, electronics, power systems and – most importantly – the fly-by-wire controls for the E2 family.

PITCH SAFE

The "iron bird", which simulates the electronic control systems, is already operational, along with ground testing rigs for dozens of systems, including the Honeywell avionics system and the air management system.

But the full fly-by-wire system poses the most intriguing development. P&W's engines account for 11% of the E2 family's claimed improvement in fuel efficiency. The modernised airfoils and longer span of the wings contribute another 3.5% to the fuel efficiency gain.

In addition to enhancing safety, the fly-by-wire system also adds 1.5% to the fuel efficiency total. In a conventional aircraft, the centre of gravity is located forward of the centre of lift, so the horizontal tailplane is designed to exert a downward force, which counters the natural tendency of the nose to also pitch downward.

By introducing fly-by-wire, however, aircraft designers can reverse the force exerted by the horizontal tailplane, allowing both its surfaces and the wings to produce lift in cruise flight. The centre of gravity shifts rearward, but the fly-by-wire system can make constant corrections to keep the nose from tending to pitch upwards.

"We are starting to test the fly-by-wire software... so far, so good"

LUIS CARLOS AFFONSO
Senior vice-president of operations, Embraer

Embraer's experience with fly-by-wire controls began with a rudimentary system developed for the Italian/Brazilian AMX-T combat aircraft. It first introduced a full fly-by-wire system on the Legacy 500 business jet, but development delays held up the project by two years. For the E-Jet E2 family, Embraer has shifted to a new supplier. For decades, Moog has been a key supplier of fly-by-wire systems for Boeing, and now is providing the E2 family with primary control actuation and flight control computers, plus the software for the control laws and the operating system that integrates the control laws into the computers.

Larger, heavier wings are required to accommodate the Pratt & Whitney geared turbofan engines

Embraer

"The test benches are operational, which is a big achievement to have the benches configured to test the software," Affonso says. "And we are starting to test the fly-by-wire software. Several other loads are planned but, so far, so good."

Despite the move to a fly-by-wire system, Embraer is designing the E2 cockpit with the same yokes found in the E1 family. The Legacy 450/500 and the KC-390 military transport/tanker projects have familiarised Embraer with sidestick controllers in fly-by-wire aircraft. An overriding design goal for the E2 was to retain as much commonality with the E1 as possible, with a target to limit transition pilot training for E1 pilots to no more than three days.

Re-engining programmes usually start with a mature production system for the fuselage, but there are limits to how much commonality Embraer wanted to carry over into the E2 programme.

The larger, heavier and redesigned wings, for example, required Embraer to tweak the internal structure of the E190-E2's centre fuselage section, Affonso says. The new design also incorporates structural changes to improve service life.

"For instance, corrosion is something that can be an issue in a fuselage, especially in areas like the floor beams and the galleys and doors areas," he says. "In this fuselage we have added titanium caps over the beams so that the airplane is virtually corrosion-proof in those areas."

ROAD TO AUTOMATION

The fly-by-wire system for the E2 family is not the only contribution from experience gained via the KC-390 and Legacy 500 programmes. In both projects, Embraer began to introduce automation into its production system.

"We are very fortunate that we are between executive aviation, defence, and commercial. We have been developing several airplanes almost continuously. So if you look at the Legacy 500s, the KC-390 and the E2 – these are, let's say, a continuous progression. We have lots of automation already on the Legacy 500 and the KC-390, and on the E2 we are going for a further step," Affonso says.

Automated machines are designed by Electro-Impact, based in Mulkiteo, Washington, and the designer of robotic systems used by Boeing and a host of aerospace manufacturers. The machines for the E2 family are used to drill thousands of holes in the wing assemblies, seal the openings and then install the rivets.

"When you compare the E2 to the E1, there is a big leap in many senses, but if you think, we have done four new platforms from E1 to E2," Affonso says. "So you see that it's a low-risk approach for technology introduction." ■


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PLATFORM STAND-OFF

A US Air Force bid to cut costs by building a new attack radar fleet around modified business jets has Boeing, Bombardier and Gulfstream eyeing a $6bn bonanza

JAMES DREW SAVANNAH

The US Air Force's $6 billion programme to replace the Boeing 707-based Northrop Grumman E-8C Joint Surveillance Target Attack Radar System (JSTARS) is shaping up as a battle between platform providers rather than the primes, with Boeing, Bombardier and Gulfstream locked in a three-way contest to supply aircraft for the 17-unit order.

The prime motivation for the radar-carrying aircraft competition is to drastically cut the operating and maintenance cost of the Boeing 707-300-based E-8C by migrating to a modern "business jet" – specifically an aircraft with 80% less fuel consumption and a crew of just 12, down from 21.

But the three aspiring prime contractors selected to develop detailed proposals ahead of competition for a development contract are taking very different approaches to the challenge. Programme incumbent Northrop Grumman is working with a Gulfstream 550 or 650, Lockheed Martin's choice is a Bombardier Global 5000 or 6000, and Boeing is offering a development of its 737-700BBJ.

DEVELOPMENT CONTRACT

Each team recently received $10 million for an 11-month risk reduction phase ahead of a competitive downselect for the development contract in 2017. The current air force schedule places initial operational capability in 2024 and full capability with 17 mission aircraft in 2027.

The platforms under consideration all have inherent strengths and weaknesses – although the larger Boeing Business Jet (BBJ) is an outlier in terms of cabin size, considered a "business liner" by some.

Whichever solution is finally selected will have to replace one of the USAF's most potent systems. The E-8 made its combat debut in Operation Desert Storm in 1991 and has provided critical capability in every major US combat operation since, using its 7.3m-long (24ft) side-looking phased array radar to detect enemy ground and maritime movements and low-flying aircraft over a 50,000km^2 area.

CONTRACTS **JAMES DREW** SAVANNAH

NORTHROP SAYS IT IS READY TO GO AND ALREADY HAS AN '85%' SOLUTION

NORTHROP GRUMMAN says it shouldn't take 16 years for the US Air Force to recapitalise the Boeing 707-based E-8C Joint Surveillance Target Attack Radar System (JSTARS) fleet, and it doesn't need an 11-month "risk-reduction" phase to get started.

The air force recently awarded $10 million contracts to Northrop, Boeing and Lockheed Martin to mature their competing next-generation JSTARS designs, but Northrop believes it already has an "85% solution" and is ready to proceed to development. In fact, the product is known internally as the "E-8D", since it uses mature technology and is considered more of an evolutionary capability advancement.

Northrop vice president and "JSTARS recap" programme lead Alan Metzger says the company is itching to go faster, and the limiting factor is funding and how fast the air force can go. The company is partnered with Gulfstream and L-3 Aerospace Systems for the programme, and intends to offer a G550 or G650 platform with a Raytheon or Northrop Electronic Systems radar. The current USAF schedule would award a four-year development contract with initial operational capability (IOC) in 2024 and full operational capability (FOC) with 17 combat-ready jets in 2027. The risk-reduction phase runs through July 2016, at which point the teams would write their proposals and hand them over to the government for a source-selection decision by August 2017.

> **"It should not take 16 years to buy some commercial aircraft, build mission system kits and deliver"**

"If you take the [analysis of alternatives] in 2011 and the FOC date of 2027 – 16 years is an awful long time, and at the end of the day we feel we could go a lot faster," Metzger said at JSTARS media event at Gulfstream's headquarters in Savannah, Georgia earlier this month. "If you want speed to ramp, you pull this stuff left and go quicker. It should not take 16 years to buy some commercial aircraft, build some [mission system] kits, do some flight tests and deliver.

COMPRESSED TIMELINE

"We have a strategy to basically give the air force a very affordable and rapid solution space that gives them the required growth and ability to add things over time in advance of their current plan. How we do that is our uniqueness."

Northrop is the first industry participant to publicly call for a compressed timeline. The company says the programme should get underway as soon as possible to avoid

The current JSTARS capability is housed on a converted Boeing 707 platform

US Air Force

Its onboard battle management specialists harness that information to alert friendly ground forces and coordinate counter-attacks or air strikes.

But the air force says the E-8C's extraordinarily high operating cost is eating its budget, and a new platform that requires less fuel, maintenance and personnel would deliver savings from day one. So while it is true the replacement's advanced radar, communications and battle management systems are central to the next-generation JSTARS design, the new platform will be the discriminator in terms of mission performance, readiness and reliability, basing, support and life-cycle cost.

For General Dynamics Gulfstream, the chance to add another special mission derivative aircraft to its portfolio of government contracts has an allure, but there is also the upfront profit from a 17-aircraft sale and long-term income from after-sale support.

On 2 September, the company flew a dozen reporters to its headquarters in Savannah, Georgia, where it produces about 130 aircraft per year (the 450, 550, and 650 types). The travel was via a company-owned 450 and 550 departing from Dulles International airport in Washington DC.

"The platform really impacts mission performance. It informs the mission systems"

TROY MILLER
VP, military and special mission sales, Gulfstream

Gulfstream executives say it makes much more financial sense to transition to a modern business jet than to keep upgrading old, second-hand 707s built in the 1960s and 1970s.

"The platform really impacts mission performance. [It] informs all the other mission systems," says Troy Miller, Gulfstream's regional vice-president of military and special mission sales.

"A platform with the mature, proven capability of the G550 and the special mission capabilities of Gulfstream really lends itself to an important air force priority and an important priority of Northrop Grumman – that's speed to ramp, and reduced life-cycle cost of the weapon system."

Northrop sees the 550 as the ideal balance aligning with the mid-2020s production ramp-ups of the Lockheed F-35, Boeing KC-46 tanker and Long-Range Strike Bomber, since there will be scarcely enough money to afford those.

"They all seem to be happening in the 2022 to 2028 kind of time frame, and that creates what the air force called a [fiscal] bow wave," says Metzger.

However, an extended time line would give rivals Lockheed and Boeing more time to catch up, and the air force insists on a competitive programme despite Northrop's natural advantage as the original JSTARS prime contractor.

When the air force was first considering how to replace JSTARS, Northrop said it could deliver a next-generation weapon system using mature, existing technology on a business jet with IOC in 2021 and FOC in 2023. The air force's first draft schedule, released in 2014, placed IOC in 2022 and FOC in 2025, but the latest air force budget proposal delayed those dates. Northrop, however, believes it can achieve its goal, depending on when the air force awards the engineering and manufacturing development contract. The company wants to start writing proposals now.

As Metzger puts it: "My team does not believe it needs an 11-month risk-reduction period. We believe we could go to proposal right now." ■

Northrop Grumman says its concept could deliver in 2021

Northrop Grumman

» between cost and performance going into the JSTARS competition, although it could potentially offer the newer, longer-range 650 if requirements change.

The 550 has a range of 6,750nm (12.500km) at Mach 0.8, compared to the 650, which has a 7,000nm range at M0.85. That is the equivalent of a non-stop hop from Washington to Tokyo for the G550, or Los Angeles to Melbourne for the 650.

AIR REFUELLING

There is also an air-to-air refuelling requirement, giving the next-generation JSTARS perhaps more endurance than required for an average mission, but enough to fly non-stop to anywhere in the world.

Miller says air refuelling has never been done on a Gulfstream business jet, but he considers it less of an engineering challenge for the 550 or 650 than for an airliner, since the fuel is stored entirely in the wings. "We have looked at probe and drogue and boom refuelling," he says. "The air force clearly has certain demands, despite the G550 meeting the refuelling requirement."

Perhaps more importantly for the JSTARS mission are the Gulfstreams' short take-off distances, high speed and cruise altitude of 41,000ft to 51,000ft.

"The air force has certain demands, despite the G550 meeting the requirement"

TROY MILLER
VP, military and special mission sales, Gulfstream

Northrop team officials note that flying higher makes an aircraft more difficult to shoot down, but it also allows its radar to cover a wider area without obstruction from mountains.

The 550's high-set Rolls-Royce BR710 engines (BR725s for the 650) and smooth underbelly also limit obstruction to the radar, mounted under the forward fuselage.

The engines generate 45kVA each, and with the addition of two 45kVA auxiliary power units, the aircraft has ample power to meet the needs of the radar, communications and computer systems. The power units and radar would be liquid cooled on the Gulfstream jet, with a special radiator mounted at the rear.

The E-8C has an outdated flight deck and large crew

US Air Force

There are currently 70 Gulfstream aircraft in service with the US government, including 23 designated as C-37s for government executive airlift, with the USAF being the largest operator. Around the world, Gulfstream jets are used for intelligence, surveillance and reconnaissance (Israel), atmospheric research (one stationed in Germany and one in the USA), airborne early warning (Israel and Singapore), maritime patrol (Japan) and medical evacuation (Saudi Arabia).

The company claims the direct operating cost of a BBJ is 46% greater than a 550 or 650, but perhaps where the Gulfstreams fall short is cabin space.

Boeing contends that the BBJ can carry far more equipment and is far roomier than a G550, which means more room for growth and greater crew comfort.

How that will factor into the final source selection decision is unclear, but both Gulfstream and Bombardier will struggle to compete with the crew space and payload provided by the Boeing candidate.

EXCEEDS REQUIREMENTS

Northrop is confident its JSTARS system requires no more than 10 mission specialists working at 10 computer stations; with two pilots and a third back-up pilot, there is enough room on the 550.

Northrop vice-president and JSTARS programme lead Alan Metzger says the 550 is the right match, and meets or exceeds all of the draft requirements produced by the air force to date.

If successful, Gulfstream says it would need 12 to 18 months lead time to deliver the first aircraft. The next available spot in the production line is 2017, it says.

The 450 and 550 are assembled on the same line, and would be delivered without modification to Northrop and the third team member, L-3 Aerospace Systems, for conversion into a JSTARS platform. ■

A Gulfstream V is being used as a testbed for a G550 in JSTARS configuration

Gulfstream

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Memories of Manchester '85

I raise two issues about the British Airways Boeing 777 incident that ocurred at McCarran airport, Las Vegas.

Firstly, media images of flames and smoke blowing very noticeably across the plane from left to right and seconds from penetrating the cabin, have given me cause for concern.

Many of us will remember similar scenes at the UK's Manchester airport in 1985 when a British Airtours 737 suffered a port engine explosion during take-off.

Fire fatally engulfed the plane, in part because a cross-wind blew the flames across the fuselage when it stopped on a slip road at an angle to the runway.

Apparently, both pilots in Las Vegas were aware of the cross-wind before commencing their roll, so surely they should have turned the airliner about 180° at a suitable moment, as part of what is presumably their aborted take-off procedure?

My second point is that, although I have seen reports praising the crew for the successful evacuation, it must be remembered that the airliner had 157 passengers on board.

I do not think the outcome would have been the same if the 777 had been full – with around 270 passengers on board – given the severity of the fire and the disturbing media images of many passengers evacuating with their flammable duty free and carry-on suitcases, putting fellow passengers at risk.

It is assumed that British Airways' cabin crew did their best to deter passengers from grabbing luggage before jumping down emergency slides.

But both BA and the US National Transportation Safety Board must urgently shed light on this situation and the stopping position.

Matthew Moore
Hungerford, Berkshire, UK

EVACUATION

Learning lessons from the past

The captain and crew of the British Airways Boeing 777 which recently experienced a serious engine failure and subsequent fire while taking off from Las Vegas McCarran airport are to be commended on their actions, and the fact that there were no fatalities or serious injuries.

NTSB

The damaged 777 in Las Vegas

However, I note that the aircraft was brought to rest with the affected engine on the windward side so that smoke and flames were blown towards the fuselage, preventing the use of at least one emergency exit and potentially allowing the fire to spread and admit noxious smoke into the cabin. A similar scenario occurred in 1984 with a British Airtours 737 at Manchester airport where there were many fatalities.

As a result we air traffic controllers were subsequently trained to advise and assist a pilot to position the aircraft such that any fire was on the downwind side before evacuation commenced.

It may be that in the case of the Las Vegas incident, the captain decided that the fire was so serious that an immediate evacuation was required, but I hope that the lessons of the Manchester incident, and now this one at Las Vegas, are not to be forgotten.

Leo Marriott
Weston-super-Mare, Somerset, UK

Team triumphs

I find it impossible to think of an example of a better co-ordination of flight and cabin crew, air traffic control and ground fire team focussed on avoiding a potentially disastrous loss of life.

The British Airways incident at Las Vegas was textbook stuff. Well done to all.

John Wallinger
Upton Grey, Hampshire, UK

A passive stance on UK defence

Your article entitled "Tough Decisions" (*Flight International*, 8-14 September) avoids the real problem facing the UK's 2015 Strategic Defence and Security Review (SDSR).

That is, febrile and reactive political decision making.

The political classes and our co-rulers, the media manipulators, are entirely governed by their own success and renewal and are dismissive of nationality and military strength.

The statements made by our political leaders in a frantic response to the refugee crisis and the potential fall-out from those mistakes, render all financial decisions moot.

Combine this with the election of a person who is publicly opposed to the use of military force in any conceivable situation as leader of Her Majesty's loyal opposition, then the situation becomes critical.

In any sane world, the top priority for the UK government would be aircraft to equip the carriers, maritime patrol aircraft and a general increase in air strength and in naval platforms.

Steve Page
via email


Ben Cawthra/Rex Shutterstock

Opposition leader: Corbyn

From yuckspeak to tales of yore, send your offcuts to murdo.morrison@flightglobal.com

Chance to keep flying boat afloat

Plane Sailing Air Displays is having a busy year on the show circuit with its restored World War Two-vintage Catalina flying boat, G-PBYA. The team even found time to take a student party from Worksop College in the UK to Greenland and back in July – some school trip!

PSAD is holding another ticket-only event for potential shareholders in this remarkable aircraft – ordered for the Royal Canadian Air Force and which went into service in 1943 as part of the defence of Canada's west coast from a Japanese invasion.

The event, at Duxford, takes place on 4 October. Details from pby5@btinternet.com

Plane Sailing Air Displays

Fancy a plunge? The impeccably restored Catalina G-PBYA

Smiths myths

Our chance spot of this Turkish Airlines 737 in Bari got us thinking about aviation-themed tunes 1980s Mancunian miserablists Morrissey and The Smiths might have penned (along the lines of "You're the one for me, Fatih").

We came up with: "Diehl around the fountain", "This Garmin man", "Girlfriend in a Comac", "Williams, it was really nothing", "Dreamlifters of the world, unite", "Sheila in a Boeing" and "There is a light jet that never goes out".

And, finally, an actual Smiths song dedicated to all those programmes that never quite make it to certification: "I started something I couldn't finish". Okay… it's been a quiet week in Budgie Towers.

Normandy re-landing

Three patriotic cheers for Barrie Prescott, chief executive of Goodwood airport-based charter operator Conciair, who to mark Queen Elizabeth II becoming Britain's longest-serving monarch, flew six World War Two veterans on a day trip to Normandy on 11 September.

The free tour, in a Piper Chieftan, took in the D-Day beaches, Pegasus Bridge and lunch with Arlette Gondrée, whose house was first to be liberated in 1944.

Easy mistake

"EasyJet expects busiest day in flying history today", proclaimed a press release from the low-cost carrier. Closer reading revealed, however, that 4 September was not set to see more passengers than ever in the world's skies – simply record traffic figures for EasyJet as families returned for the start of school.

An achievement worth noting, but perhaps not the significant global milestone suggested by the headline.

Out of here

What can TV station WKRG have been suggesting when it interviewed a colleague of Mary "Runway Girl" Kirby, who jilted us to found her own aviation news site a few years ago? The caption read: "Seth Miller, Runaway Girl Network".

Craig Hoyle/Flightglobal

737 nose I'm miserable now

A generous gift

100 YEARS AGO

Members of the British Society in the Argentine Republic have, through the League of the Empire, its representative in England, presented an aeroplane to the Army Council. The aeroplane has been accepted by the Government and will be named the River Plate.

Attacks success

75 YEARS AGO

On Wednesday, September 18, a highly successful air attack was launched on Italian bases in the Dodecanese Islands. At Maritza and Rhodes fires were started, and several explosions, followed by a large fire, were also observed at Calato.

Heat shield deal

50 YEARS AGO

Apollo Heatshields: A follow-on contract for approximately $22 million has been awarded by North American Aviation to the Research and Advanced Development Division of Avco Corporation for 13 ablative heat shields for Apollo command modules designed for test missions in lunar orbit.

Cruise control

25 YEARS AGO

The UK appears to have successfully foiled Iraqi attempts to develop a cruise or stand-off missile by blocking access to the key technologies necessary for the development of such a capability.

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flightglobalevents.com/APS15

29-30 September
New Generation of Airline Passenger Systems
London, UK
flightglobalevents.com/pss2015

1 October
US Corporate Aviation Summit
Fort Lauderdale, Florida
aeropodium.com/uscas

1-2 October
Central Asian Aviation Symposium
Almaty, Kazakhstan
aeropodium.com/caa

6-8 October
Helitech International
ExCel, London, UK
helitechevents.com

14-15 October
Aerospace Innovation Forum
Palais des Congrès, Bordeaux, France
aerospace-innovation-forum.com

8-12 November
Dubai Air Show
Dubai World Central
dubaiairshow.aero

12 November
Ascend West Coast: Finance
San Francisco, USA
flightglobalevents.com/ascendwestcoast15

15-17 November
ALTA Airline Leaders Forum
San Juan, Puerto Rico
alta.aero/airlineleaders/2015

17-19 November
NBAA 2015
Las Vegas, USA
nbaa.org/events/bace/2015

17-19 November
Aerospace & Defense Meetings Torino
Torino, Italy
bciaerospace.com/turin

19-20 November
Safety In African Aviation
Kigali, Rwanda
2gether4safety.org

1-2 December
Military Airlift & Rapid Reaction Ops
Seville, Spain
smi-online.co.uk/defence/europe

8-10 December
Aerospace Meetings Brazil
São Paulo, Brazil
bciaerospace.com/brazil

3-4 February 2016
Aircraft Interiors Middle East
Dubai World Trade Centre, UAE
aime.aero/welcome-to-aime-2016

16-21 February 2016
Singapore Air Show
Changi Exhibition Centre, Singapore
singaporeairshow.com

18-21 April 2016
Defence Services Asia
Putra World Trade Centre, Kuala Lumpur
dsaexhibition.com

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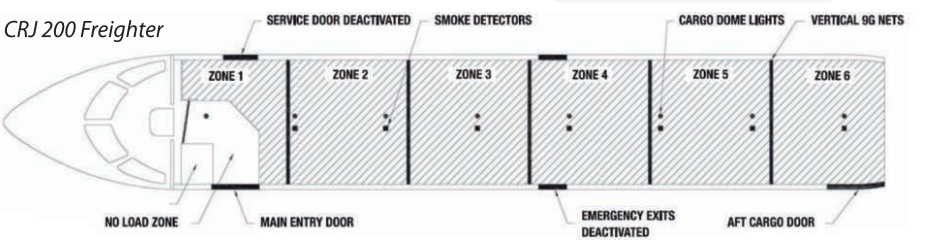

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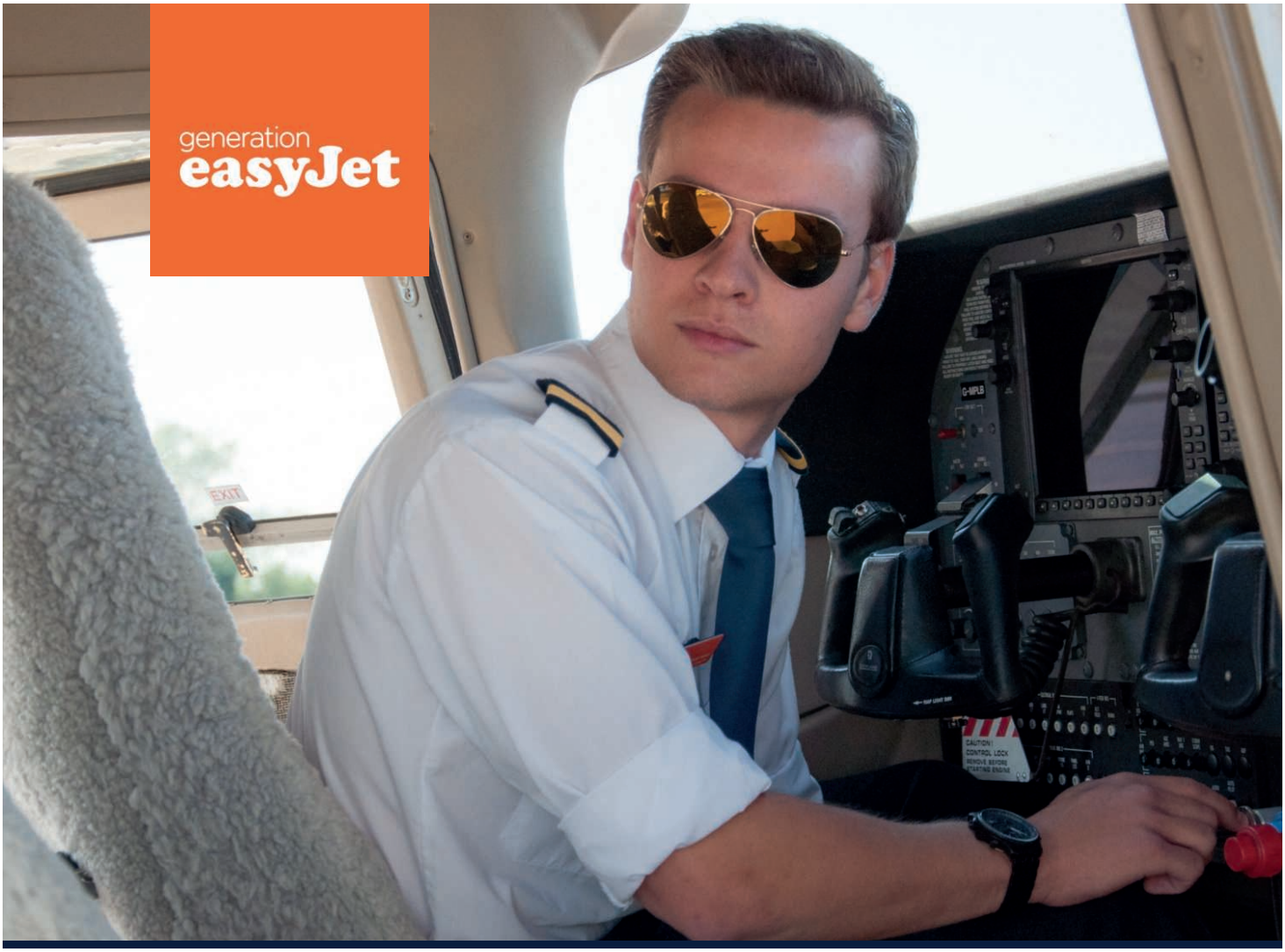

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WORK EXPERIENCE JONATHAN NICOL

Proving the doubters were wrong

When charter jet operators told the Stratajet chief it would be impossible to start a real-time, online booking platform because of the variables involved, the challenge set him off on a four-year mission to do just that

Tell us about your career so far

It's been varied. After A-levels I went into the RAF, where I was selected to fly Panavia Tornado GR4s. I was then seduced by the Army Air Corps [Boeing] Apache AH-64 programme and found myself at Sandhurst military academy for army officer training. It was decided I should be sent on a tour commanding soldiers. I was selected to command a troop of Desert Rats, so in 2000 I headed around the globe, starting in Kosovo. In 2004 I left the military and took a sabbatical to start Promotional Staff UK (PSUK), which is where I found the next passion in my life – business.

The company did exceptionally well, and launched my career as a start-up chief executive. After 11 months at PSUK I was recalled to the army for a tour, which flowed nicely into my next start-up, Oxford Computer Information Systems (OXCIS).

I had plenty of free time during the company's development phase and spent some of it flying Cessna Citation CJ2 business jets for Hangar 8 [now part of Gama Aviation]. While in the CJ2 one day, the idea for Stratajet came to me – a real-time, online business jet booking platform. The project has taken more than four years.

What about your current role?

As the chief executive of a tech start-up, the role always encompasses a lot of things but, essentially, mine started around building the code base. That said, we've quadrupled the size of the team in three months, so I'm increasingly taking on a leadership role. One of my main focuses is to build a 12-strong sales and marketing team. We have been very fortunate at Stratajet in that a great number of very talented people want to work here.

Stratajet

Four years on, Nicol has come up with the perfect response to naysayers

Why launch Stratajet?

Someone had to. Private jets are the last form of transport not readily accessible in price and availability. Every other form of transport, from bikes to scheduled airlines, is instantly bookable – yet ironically, the most convenient form of transport can take two days to book. The business aircraft charter market is hugely underdeveloped, with 0.001% of travellers [routinely] using private aircraft, compared with 5% in [airline] business class. Stratajet can open up this market to many more, and by removing the broker, we are able to offer business aircraft at much lower prices. But the real determination for Stratajet – which has kept me going for four years – was the reaction of operators at EBACE in May 2011, who categorically told me it could not be done. They believed there are too many variables in the pricing of flights – from aircraft costs to landing and handling fees – that are constantly changing. How could anybody resist the challenge? You can imagine my elation at the end of last year when it all came together.

> "While in the CJ2 one day, the idea for Stratajet came to me"

What are your biggest challenges?

The biggest challenge is making it clear we are different from private jet quoting companies. In recent years companies have come into market claiming to provide online and real-time bookings for private jets. I have yet to see one that offers anything more than giving the consumer the ability to request a quote via email. The consumer gets a raw deal because, as soon as they request a quote, they have to wait – sometimes days – to get prices back. This form of quoting is obviously incapable of making efficiency savings based on real-time scheduling. It has been a real problem for operators because it is so simple to request a quote from a website.

Other companies are putting a tremendous strain on operators by forcing them to respond to quote requests, when the person requesting it could be a 14-year-old at the back of a classroom who is curious about the cost of private jet travel. This challenge is overcome once we explain to operators they only ever get bookings from our system – never quote requests.

What do you enjoy most about your job?

Leading the team and seeing them getting as passionate about Stratajet as I am. ■

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C Series



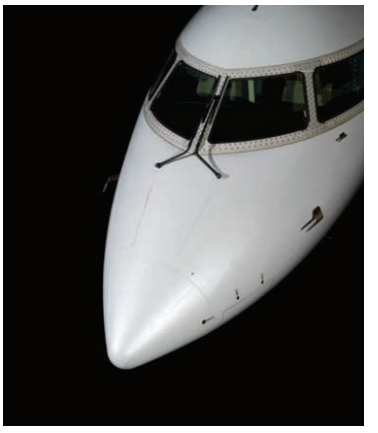
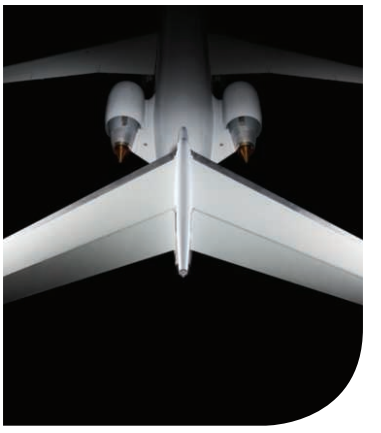






Q Series

CRJ Series

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